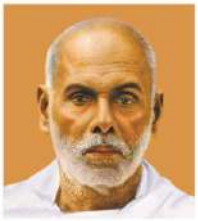
Est. 2003

Sree Narayana Guru College of Engineering & Technology

CHALAKKODE P.O., KOROM, PAYYANUR, KANNUR-670 307

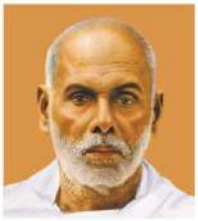


SAMPLES OF LAB RECORDS

Est. 2003

Sree Narayana Guru College of Engineering & Technology

CHALAKKODE P.O., KOROM, PAYYANUR, KANNUR-670 307



DEPARTMENT OF CIVIL ENGINEERING

SREE NARAYANA GURU
COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR – 670 307

CERTIFICATE

Name....PRANAV A K.....
Semester.....S4..... Branch. ...CIVIL.....
Roll No.....16.....Uni. Reg. No...SNC19CE014...

Certified that this is a Bonafide Record of the work done in the ...ENVIRONMENTAL ENGINEERING LAB.. *of Sree Narayana Guru College of Engineering & Technology, Payyanur by Mr. / Miss.* ...PRANAV A K.....

Place : PAYYANUR

Date :

Staff Member Incharge

DEPARTMENT OF CIVIL ENGINEERING

Internal Examiner

HOD

External Examiner

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

INDEX

Sl. No.	NAME OF EXPERIMENT	DATE	PAGE No.	INITIAL OF TEACHER
1.	DETERMINATION OF HARDNESS	27/9/22	2	
2.	DETERMINATION OF ALKALINITY	27/9/22	5	28/9/22
3.	DETERMINATION OF CHLORIDE	11/10/22	9	
4.	DETERMINATION OF ACIDITY	11/10/22	11	12/10/22
5.	DETERMINATION OF pH	19/10/22	13	
6.	DETERMINATION OF TURBIDITY	19/10/22	15	26/10/22
7.	DETERMINATION OF BOD	1/11/22	17	
8.	DETERMINATION OF AVAILBLE CHLORINE IN SAMPLE OF BLEACHING POWDER	1/11/22	19	
9.	DETERMINATION OF DO	1/11/22	22	2/11/22
10	BREAKPOINT CHLORINATION	1/11/22	25	
11.	DETERMINATION OF ELECTRICAL CONDUCTIVITY	1/11/22	27	
12.	DETERMINATION OF TS, TDS, TSS TVS	15/11/22	29	16/11/22
13.	DETERMINATION OF CHEMICAL OXYGEN DEMAND	29/11/22	32	
14.	DETERMINATION OF OPTIMUM COAGULATION DOSAGE	29/11/22	34	30/11/22
15.	DETERMINATION OF COLIFORM	6/12/22	36	7/12/22

HOD

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

EXPT NO: 1

27/9/22

DETERMINATION OF HARDNESS

AIM

To determine the hardness of given water sample

PRINCIPLE

Ethylene diamine tetra acetic (EDTA) method of determination of hardness, involves the use of solutions of EDTA or its sodium salt as the titrating agent. The complexes usually represented as EDTA ~~or its sodium salt as the~~ chelating agents and form extensively stable complex ions with Ca^{2+} and Mg^{++} and other divalant ions causing hardness as shown in equation

M^{++} +EDTA M. EDTA complex

The dye called Eriochrome black T (EBT) serves as excellent indicator to show when all the hardness producing ions have been complexed. When EBT is added to the aquous solution containing small calcium & magnisium ions at a pH of 10 +/ -0.1, the solution becomes wine red, Higher the pH sharper the end point. However above pH 10, there is a danger of precipitation of calcium carbonate and magnesium hydroxide. When a small amount of EBT having ~~bu~~ blue colour is added to hard water with a pH of about 10 it combines with a few of the Ca^{++} & Mg^{++} ions to form a week complex ions which is wine red in colour

OBSERVATION AND CALCULATION

Vol of Sample	Burette reading		Vol of EDTA (V)	Hardness of $CaCO_3$ (mg/l)
	Initial	Final		
20	0	9		
20	9	11.2	2.2	110
20	11.2	13.2		

Hardness in mg/l as Calcium Carbonate

$$= \frac{V_1 \times S \times 1000}{V} = \frac{2.2 \times 1 \times 1000}{20}$$

$$= 110 \text{ mg/l}$$

V_1 = ml of titrant used

V = vol of sample

S = mg of $CaCO_3$ equivalent to 1ml of EDTA.

M^{++} + EBT M·EBT complex

During the titration with EDTA all free hardness ions are complexed. Finally the EDTA disrupts the red EBT because it is capable of forming a more stable complex with the hardness ions. This action frees EBT indicator. and the wine red colour changes to a distinct blue colour, indicating the end of the titration. An accurate method of determining hardness is calculation based upon concentration of divalent ion.

APPARATUS

1. Burette
2. Pipette
3. Erlenmeyer flask

REAGENTS

1. 0.01 M EDTA
2. Ammonium buffer solution.
3. Eriochrome black T (EBT)
4. Litmus paper

PROCEDURE

1. A sample volume V which requires less than 15 ml. EDTA titrant is chosen
2. One or two ml. of buffer solution is added. Aims to bring the pH to 10 +- 0.1
3. One or two drops of the indicator solution are added. If there is Ca or Mg hardness, solution turns to wine red.

4. EDTA titrant is added from the burette with vigorous shaking till the wine red colour just turns to blue.
5. The volume of the titrant added is noted down (V_1)
6. Procedure is repeated for concordant values.

RESULT

Hardness of given water sample = 110 mg/l

INFERENCE

As per IS-10500-1991 desirable limit as hardness is 310 mg/l in potable water. The obtained value of water sample is 110 mg/l. It indicate water is moderately hard.

28/9/22 26/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO : 2

27/9/22

DETERMINATION OF ALKALINITY

AIM

To determine the alkalinity in the given water sample

PRINCIPLE

Alkalinity can be obtained by neutralizing OH^-, $CaCO_3^{2-}$ & HCO_3^{3-} with standard H_2SO_4. Titration to pH 8.3 or decolourisation of Phenolphthelium indicator will show complete neutralization of OH^- and 1/3 CO_3^{2-} while to pH 4.4 or sharp change from yellow to pink of methyle orange indicator total alkalinity.

$$Ca(OH)_2 + H_2SO_4 \longrightarrow CaSO_4 + 2H_2O$$
$$2\,CaCO_3 + H_2SO_4 \longrightarrow Ca(HCO_3)_2 + CaSO_4$$
$$Ca(HCO_3)_2 + H_2SO_4 \longrightarrow CaSO_4 + CO_2$$

APPARATUS

Burettes, Volumetric flasks, conical flasks, Measuring cylinder and beakers.

REAGENTS

0.05N Standard Sodium carbonate solution: Dry 3 to 8g of Sodium carbonate, Na_2CO_3 at 250°c for 4 hr and cool in a dessicator. Accurately weigh 2.5 ± 0.2g to the nearest mg, dissolve in distilled water and make to 1L.

0.1N standard H_2SO_4 solution: Dilute 2.8 mL conc. Sulphuric acid to 1L. Standardise against 40.00 mL 0.05N Na_2CO_3

OBSERVATION AND CALCULATION

Titration 1 (for phenolphthalein alkalinity)

Burette sol : H_2SO_4
Pipette sol : Sample
Indicator : phenolphthalein
End point : Disappearance of pink colour

Sample No	Vol of Sample (V)	Burette reading		Vol of H_2SO_4 (V1)
		Initial	Final	
1	25	0	7.5	7.5
2	25	0	7.5	

Titration 2 (For total alkalinity)

Burette Sol : H_2SO_4
Pipette Sol : sample
Indicator : mixed indicator
End point : Appearance of pink colour

Sample No	Vol of Sample	Burette reading		Vol of H_2SO_4
		Initial	Final	
1	25	0	3.8	3.8
2	25	0	3.8	

Phenolphthalein alkalinity (P) as $CaCO_3$

$$P = \frac{V_1 \times N \text{ of } H_2SO_4 \times 50000}{\text{Vol of Sample}}$$

$$= \frac{7.5 \times 0.02 \times 50000}{25} = 300 \text{ mg/l}$$

Total alkalinity $= \frac{3.8 \times 0.02 \times 50000}{25} = 154 \text{ mg/l}$

with about 60ml distilled water, in a beaker by titrating potentiometrically to pH 5. Lift out electrodes, rinse into the same beaker and boil gently for 3 to 5 min under a watch glass cover.

Normally, $N = (A \times B)$ $(53 \times C)$

where,

A = g Na_2CO_3 weighed into the 1L flask for the Na_2CO_3

B = mL Na_2CO_3 solution taken for standardisation titration

C = mL acid used in standardised titration.

0.02N standard sulphuric acid solution: Dilute the approximate 0.1N solution to 1L

Volume (mL) = 2N/20

where N = exact normality of the approximate 0.1N sol.

Phenolphthalium indicator solution (alcoholic, pH 8.3)
Dissolve 8g phenolphthalium in 500mL of 95% ethyl alcohol. Add 500mL distilled water.

Mixed indicator (methyl orange indicator) - Dissolve 20g of methyl red, 100 mg of bromo crystal green in 100mL ethyl or isopropyl alcohol.

PROCEDURE

Phenolphthalium alkalinity

1. Take 25 to 50mL sample in a conical flask.
2. Add 2 to 3 drops of phenolphthalium indicator. If it turns pink (pH > 8.3), titrate with 0.02N H_2SO_4 till the pink colour disappear. Record volume (mL) of titrant used.

Total alkalinity:

1. Add a drop of mixed indicator to the solution in which the phenolphthaline alkalinity is determined.

phenolphthaline alkalinity (P) (as $CaCO_3$) = $\frac{V_1 \times N \text{ of } H_2SO_4 \times 50000}{\text{Vol. of sample}}$

Total alkalinity (T) (as $CaCO_3$) = $\frac{V_2 \times N \text{ of } H_2SO_4 \times 50,000}{\text{Vol. of sample}}$.

2. Titrate it against 0.02N sulphuric acid. Appearance of pink colour indicator the end point.

RESULT

Phenolphthaline alkalinity = 300 mg/l
Methyl orange alkalinity = 154 mg/l
total alkalinity = 154 mg/l

INFERENCE

As per IS 10500 : 1991 the desirable limit of alkalinity in portable water is 200 mg/l. However absence of any alternate source is permissible limit shall be 600 mg/l as $CaCO_3$. The total alkalinity of given sample is 154 mg/l hence the sample is not portable.

28/9/22

26/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO : 3

11/10/22

DETERMINATION OF CHLORICE

AIM

To determine the chloride concentration present in given water sample.

PRINCIPLE

Chloride ion concentration in the water can be determined by titration with silver nitrate. As the silver nitrate solution is slowly added, a precipitate of silver chloride forms.

$$Ag^+(aq) + Cl^-(aq) \longrightarrow AgCl(s)$$

The end point of the titration occurs when all the chloride ions are precipitated. Then additional silver ions react with the chromate ions of the indicator, potassium chloride to form a red-brown precipitate of silver chromate.

$$2Ag^+(aq) + CrO_4^-(aq) \longrightarrow Ag_2CrO_4(s)$$

APPARATUS

Burette, pipettle, conical flask, beaker, measuring cylinder, weighing balance, stirrer etc.

REAGENTS

Indicator 5% K_2CrO_4 : 1g of K_2CrO_4 dissolved in

OBSERVATION AND CALCULATION

Trail	Vol of $AgNO_3$ (ml)		FR - IR
	Initial	Final	
Blank	0	1.4	
1	0	10.8	10.8
2	0	10.8	

$$\text{chloride in mg/l} = \frac{(V_1 - V_2) - \text{No. of } AgNO_3 \times 33.45 \times 1000}{\text{Vol of Sample}}$$

$$= 177.3 \text{ mg/l}$$

20ml of distilled water
$AgNO_3$ solution

PROCEDURE

1. Take 25ml of sample in the conical flask. Adjust the sample pH b/t to be 7 to 8 by adding sulphuric acid or sodium hydroxide solution.
2. Add 1ml of Potassium chromate to get light yellow colour.
3. Titrate with standard silver nitrate ($AgNO_3$) solution till the colour change from yellow to brick red. Note down the volume of $AgNO_3$ solution added (V_1)
4. Repeat the above procedure for the blank sample (distilled water) and note down the vol of $AgNO_3$ solutions added (V_2).

RESULT

Chloride concentration in the given sample = 177.34 mg/l

INFERENCE

The desirable limit of chloride content is 250 mg/l and permissible limit is 1000 mg/l as per IS-10500-1991. The result obtained for sample tested is 177.34 mg/l. The sample has no chloride content.

26/30

12/10/22

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO : 4

11/10/22

11

DETERMINATION OF ACIDITY

AIM

To determine the acidity in the given water and waste sample.

PRINCIPLE

Hydrogen ions present in a sample as a result of dissociation or hydrolyse of solutes are neutralised by titration with standard alkali. The acidity thus depends upon the end point pH or indicator used.

APPARATUS

Burette, pipette, conical flask, Measuring cylinder, volumetric flask and beakers.

REAGENTS

0.02N NaOH solution: Dissolve 0.8g of NaOH in distilled water and dilute to 1000ml.

Methyl orange indicator

Phenolphthalene indicator.

PROCEDURE

1. Pipette out 25ml of sample into conical flask. Add 2 drops of methyl orange indicator to the sample solution.

2. Titrate the sample solution against 0.02N sodium hydroxide solution. The endpoint is noted when the

OBSERVATION AND CALCULATION

Titration 1 (For methyl orange acidity)

Burette Sol : NaOH

pipette Sol : Sample

Indicator : Methyl orange

End point : Yellow

Sample No	Vol of Sample	Burette reading		Vol of NaOH
		Initial	Final	
1	25	0	5.4	5.4
2	25	0	5.4	

Titration 2 (For total acidity)

Burette reading Sol : NaOH

Pipette Sol : Sample

Indicator : phenolphthalein

End point : Pink

Sample No	Vol of Sample	Burette reading Initial	Burette reading Final	Vol of NaOH
1	25	0	6.2	6.2
2	25	0	6.2	

methyl orange acidity due to mineral acidity (as $CaCO_3$)

$$= \frac{V_1 \times N \text{ of } NaOH \times 50000}{\text{Vol of Sample}}$$

$$= \frac{5.4 \times 0.02 \times 50000}{25}$$

$$= 216 \text{ mg/l}$$

Phenolphthalein acidity = Total acidity (as $CaCO_3$)

$$= \frac{V \times N \text{ of } NaOH \times 50000}{\text{Vol of Sample}}$$

$$= \frac{6.2 \times 0.02 \times 50000}{25}$$

$$= 248 \text{ mg/l}$$

colour changes from orange, red to yellow.

3. Add two drops of phenolphthalin indicator and continues the titration till a pink colour formation. Note down the volume of the titrant used.

RESULT

Methyl orange used = 216 mg/l

Phenolphthalin used = 248 mg/l

Total acidity = 248 mg/l

INFERENCE

Range of acidity is specified as the mineral acidity is restricted indirectly by the stipulation of pH in the range of 6.5 - 8.5 and the acidity due to CO_2 is never known to create any public health problems.

26/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO: 5

19/10/22

DETERMINATION OF pH

AIM

To determine pH of given water sample

APPARATUS

pH meter, Beaker

PRINCIPLE

The pH electrode used in the pH measurement is a combined glass electrode. It consists of sensing of sensing half cell and reference half-cell, together form an electrode system. The sensing half-cell is a thin pH sensitive semi-permeable membrane, separating two solutions.

PROCEDURE

1. Rinse the probe with distilled water. Calibrate pH meter using reference solution.

2. Rinse the probe with sample and dip the pH measuring probe in the sample and read the value of pH on the screen of the pH meter.

3. Rinse the probe with distilled / deionized water b/w sample.

4. Thoroughly rinse the probe in distilled water after measured. Keep it in distilled water when not in.

OBSERVATION AND CALCULATION

Sample No	pH	
	pH meter	pH paper
A	7	6
B	4.2	4
C	9.3	12

RESULT

Sample A : Neutral Solution

Sample B : Acid Solution

Sample C : Basic Solution

INFERENCE

As per IS 10500: 1991, the pH value of water is 6.5 to 8. Our finding are for sample the pH of water is neutral. for sample 2 the pH of water is acidic and sample 3 of pH of water is basic in nature.

20/10/22

26/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO: 6

19/10/22

DETERMINATION OF TURBIDITY

AIM

To determine the turbidity of given water sample.

PRINCIPLE

Turbidity is measured photo-metrically by determining the percentage of light of a given intensity is scattered or absorbed.

APPARATUS

Turbidity meter, sample tubes

REAGENTS

Reference standard turbidity solutions (0.2, 10 & 1000 NTU)

PROCEDURE

1) Switch on turbidity meter and wait for few minutes till the instrument warms up.
2) Shake the standard solution present in the cell / bottle before keeping it in sample chamber / holder & measure the turbidity of the reference standard solution.
3) Any deviation in reading of the reference solution, calibrate the instrument using calibration switch.
4) Shake the sample before keeping it in sample chamber and note down the turbidity of the sample

OBSERVATION AND CALCULATION

Sample NO	Turbidity (NTU)
1	65

RESULT

Turbidity of given water sample is 65 NTU

INFERENCE

Acceptable limit for turbidity in water as per IS 10500 is 5-10 NTU. Since the water sample taken has turbidity 80 NTU, which is high turbidity.

26/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO : 7

1/11/22

DETERMINATION OF BIOCHEMICAL OXYGEN DEMAND

AIM

To determine the BOD of the given sample

PRINCIPLE

The BOD is measured by determining the oxygen consumed from a sample placed in an air-tight container and kept in a controlled environment for a preselected period of time

APPARATUS

BOD bottles, burette, Pipette, conical flask, BOD incubator

REAGENTS

1. Phosphate buffer solution
2. Magnesium sulphate solution
3. Calcium chloride solution
4. Ferric chloride solution
5. Dilution water

PROCEDURE

1. Dilute the settled sewage provided to 30-40 times using aerated tap water
2. Fill the BOD bottle with diluted sewage by taking care that no air bubble entraps
3. Determine the DO of the BOD sample and blank

OBSERVATION AND CALCULATION

0th day reading

Sample	Burette reading			DO in mg/l
	Final	Initial	FR-IR	
Blank	3.5	0	3.5	109.35
BOD sample	8	0	4.5	

5th day reading

Sample	Burette reading			DO in mg/l
	Final	Initial	FR - IR	
Blank	6.3	0	6.3	99.9
BOD sample	6	0	6	118.8

4. Incubate both the Sample and blank BOD bottles at 20°C.
5. After 5 days take the bottles having sewage and blank from the incubator.
6. measure DO and calculate BOD 5

Ultimate BOD, $= L_o (1 - e^{-kt})$

L_t = BOD at any tim t
L_o = ultimate BOD
T = Time in days
K = BOD rate constant (0.23/day)

Result :

BOD of the given Sample = 109.35 mg/l
Ultimate BOD of the Sample = 118.8 mg/l

Inference :

The BOD of effluent should be less than 30 mg/l. If it is to be discharged to the inland surface water. The BOD of effluent should be less than 100 mg/l. If it is to be used for land irrigation. Hence the obtained value is 109.35 mg/l. So it can't be discharged to inland surface water and can't be used for land irrigation.

26/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO : 8

1/11/22

DETERMINATION AVAILABLE CHLORINE IN A SAMPLE OF BLEACHING POWDER

Aim:

To determine the available chlorine in the bleaching powder.

Principle:

Disinfectant capabilities of chlorine depend on its chemical form in water, which in turn is dependent on PH, temperature, organic content of water and other water quality factor. chlorine is used in the form of free chlorine, or as hydrochlorites. chlorine applied to water either as free chlorine or hypochlorite initially undergoes hydrolysis to form free chlorine consisting of aqueous molecular chlorine, hypochlorous acid and hypochlorite ion.

chlorine gas rapidly hydrolyses to hypochlorite hydrolyze to

$cl_2 + H_2O\ HOcl + H^+ + cl^-$

Aquous solutions of sodium or calcium hypochlorite hydrolyze to:

$Ca(Ocl)_2 + 2H_2O\ Ca_2 + + 2HOcl + 2OH^-$

$NaOcl + H_2O\ Na^+ + HOcl + OH^-$

Hypochlorous acid is a weak acid and will disassociate according to:

$HOcl \leftrightarrow H^+ + Ocl^-$

The two chemical species formed by chlorine in water, hypochlorous acid (HOcl) and hypochlorite ion (Ocl^-) are commonly referred to as "free" or "available" chlorine.

OBSERVATION AND CALCULATION

Sl. NO	Burette Reading		Vol of titrant (ml)
	Initial	Final	
1	0	1	1

Distilled water x Standard iodine solution (0.025)

Sl. NO	Burette Reading		Vol of titrant (ml)
	Initial	Final	
1	0	0.3	0.3

$$\text{mg of } Cl_2 / \text{mL } (B) = \frac{(V_1 - A_1) \text{ or } (V_1 + A_4) \times N \times 35.46}{\text{mL of bleaching powder solution}}$$

$$= \frac{1 \times 0.025 \times 35.46}{25}$$

$$= 0.035 \text{ mg/L}$$

$$\% \text{ available chlorine} = \frac{1000 \times B}{10} = \frac{1000 \times 0.035}{10}$$

$$= 3.5\%$$

Apparatus:

Beakers, conical flasks, burette.

Reagents:

Standard chlorine solution, acetic acid, potassium iodide, 0.025N Standard sodium thiosulphate solution, iodine solution (0.025N), starch indicator.

Procedure:

1. Dissolve 1g bleaching powder in 1 litre of distilled water in a volumetric flask, and stopper the container.
2. place 5ml acetic acid in an Erlenmeyer flask and add about 1g potassium iodide crystals. pour 25ml of bleaching powder solution prepared above and mix with a stirring rod.
3. Titrate with 0.025N sodium thiosulphate solution until a pale yellow colour is obtained.
4. Add 1ml of starch solution and titrate until the blue color disappears.
5. Note down the volume of sodium thiosulphate solution added (V_1)
6. Take a volume of distilled water corresponding to the sample used.
7. Add 5ml acetic acid, 1g potassium iodide and 1ml starch solution.
8. If blue colour occurs, titrate with 0.025N sodium thiosulphate solution until the blue colour disappears.
9. Record the volume of sodium thiosulphate solution added (A_1)
10. If no blue colour occurs, titrate with 0.025N iodine solution until a blue colour appears. Note down the volume of iodine (A_2)

11. Then titrate with 0.025N Sodium thiosulphate solution till the blue color disappears. Record the volume of Sodium thiosulphate solution added (A_3). Note down the difference between the volume of iodine solution and Sodium thiosulphate as A_4 ($A_4 = A_2 - A_3$)

Result:

The available chlorine in given bleaching Powder = 3.5%.

Inference:

The commercial bleaching powder normally contains low values of chlorine which vary from 25-30%. The value of available chlorine content continuously decreases of the powder is exposed to atmosphere. Before using the bleaching powder, its strength should first be checked by actual practice in the lab. Here the given bleaching powder sample consist of available chlorine 3.5%

26/30

	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO: 9

1/11/22

DETERMINATION OF DISSOLVED OXYGEN

AIM

To determine the amount of dissolved oxygen present in the given sample.

PRINCIPLE

It is based on the principle that oxygen present in the sample oxidizes the divalent magneous to its higher valency under alkaline condition and the magneous in higher state of valencies is capable of oxidizing HOI2 under acidic conditions. Thus the amount of I2 released is equivalent to the dissolved oxygen present

$$Mn^{2+} + 2OH^- \rightarrow Mn(OH_2)_2(s) \text{ (white ppt)}$$

If oxygen is present

$$Mn^{2+} + 2OH^- + O_2 \rightarrow MnO_2(s) + H_2O \text{ (red ppt)}$$

Under low pH

$$MnO_2 + 2I^- + 4H^+ \rightarrow Mn^{2+} + I_2 + 2H_2O$$

I_2 is rather insoluble in water, but forms a complex with the excess iodide present.

$$I_2 + I^- \longleftrightarrow I^{3-}$$

OBSERVATION AND CALCULATION

$$DO\ (mg/l) = \frac{\text{ml of titrant} \times \text{normality of titrant} \times 8000}{\text{Vol of sample titrated}}$$

Sl. No	Burette reading ($Na_2S_2O_3 \cdot 5H_2O$) ml		FR − IR
	Initial	Final	
1	0	6.5	6.5

Dissolved oxygen of saturated sample = vol of titrant used
= 6.5 mg/l

water temperature = 28 °C

DO at water temperature = 7.3 mg/l

% saturation of DO of given sample at water temperature $= \frac{6.5 \times 100}{7.3} = 89.04\%$

APPARATUS

300ml. BOD bottle, burette, pipettle, conical flask etc

REAGENTS

Maganous sulphate solution

Alkaline - iodide - Sodium azide solution

Starch indicator solution

Solution thiosulphate standard solution, 0.025ml.

PROCEDURE

1) Collect the sample to be tested in a 300ml. BOD bottle taking special case to avoid adding air to the liquid being collected. fill bottle completely and add stopper

2) Remove bottle stopper and add 2 ml of manganeous sulphate solution at the surface of the liquid. Add 2ml of the alkaline iodide sodium azide sol at the surface of the liquid.

3) Repeat shaking after floc has settled halfway. Allow floc to settle a second time.

4) Add 2 ml of concentrated sulfuric acid and close the bottle with stopper. Rinse the top of the bottle to remove any acid and shake well until the ppt is completely dissolved.

5) Take 203 ml of sample from the BOD bottle into a conical flask and titrate with 0.025N sodium thiosulphate until the solution is a pale yellow colour.

RESULT :

DO of given sample = 6.5 mg/L

INFERENCE :

As per IS 2296 - 1982, the drinking water source should contain a DO level more than 5 mg/l. The total sample has DO 6.5 mg/l hence the sample tested is portable which is conventionally treated and disinfected.

21/11/22

26/30

	5
	10
Result	4
Viva	3
Record	4

HOD

EXPT NO: 10

15/11/22

25

BREAKPOINT CHLORINATION

AIM:

Determination of the breakpoint with a graph by reacting chlorine and ammonia at different molar ratios.

THEORY:

Disinfection of pathogenic microorganisms is called disinfection. In order to prevent waterborne diseases, disinfection is applied to drinking water. While disinfectants should not adversely affect human beings and natural habitat, but should be toxic to pathogenic microorganisms.

MATERIALS USED:

1) A chemical containing free chlorine
2) Ammonia
3) Residual chlorine measurement reagents.

PROCEDURE:

1) Both chlorine and ammonia are added to a water sample to observe the breakpoint that the molar ratio of the samples will be 1 to 11.
2) 1 hour reaction time is waited. Then the residual chlorine is measured.

OBSERVATION AND CALCULATIONS

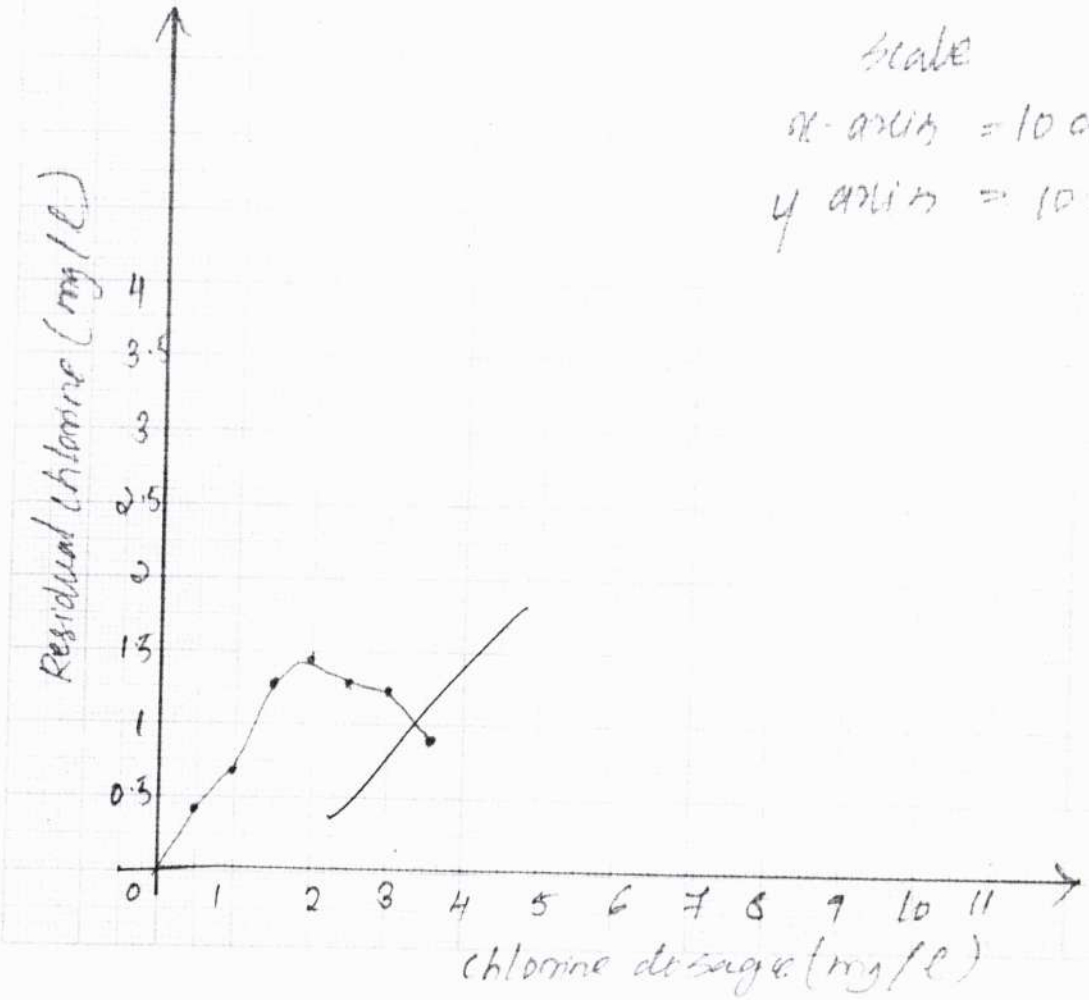
Vol of sample (ml)	Burette reading		Vol of thiosulphate (ml)
	Initial	Final	
200	0	0	0
200	0	1	1
200	0	1.5	1.5
200	0	2.9	2.9
200	0	3.3	3.3
200	0	3	3
200	0	2.9	2.9
200	0	2.1	2.1

$$\text{Residual chlorine (mg/l)} = \frac{(A-B) \times N \times 35450}{\text{ml of sample}}$$

A = The amount of $Na_2S_2O_3$ used for sample

B = The amount of $Na_2S_2O_3$ used for blank

N = Normality of $Na_2S_2O_3$



scale

x-axis = 10 div = 1mg/L

y axis = 10 div = 0.5mg/l

$$= \frac{0.025 \times 1 \times 3545}{200}$$

$$= 0.443$$

...e dosage mg/l	Titration value ml	Residual chlorine (mg/l)
0	0	0
0.5	1	0.443
1	1.5	0.664
1.5	2.9	1.28
2	3.3	1.462
2.5	3	1.329
3	2.9	1.285
3.5	2.1	0.930

Sample calculation

$$\text{Residual chlorine} = \frac{\text{Normality} \times \text{vol} \times 3545}{\text{Vol of sample taken}}$$

$$= \frac{0.025 \times 1 \times 3545}{200}$$

$$= 0.443$$

3.) Add concentrated acetic acid to each sample to bring the pH to 3-4.
4) 1g of pottassium iodide (KI) is added.
5.) The resulting colour is titrated with sodium thiosulphate until the yellow color, consumption is recorded.
6) Add 1ml of starch solution.
7) All these procedures applied to blank sample.
8.) Residual chlorine is calculated.

RESULT:
Breakpoint chlorine of water sample = 3.5 mg/l
chlorine demand of water sample = 0.930 mg/l

INFERENCE:
Permissible limit of residual chlorine in water is 0.2 mg/l to 0.5 mg/l. The water sample given residual chlorine value = 3.5 mg/l, so its not applicable for drinking purpose.

27/30

Procedure	5
Conduction	10
Result	5
Viva	3
Record	4

HOD

EXPT NO : 11

29/11/22

DETERMINATION OF ELECTRICAL CONDUCTIVITY

AIM:

To determine the conductivity of the given sample of water.

PRINCIPLE:

Conductivity is determined using the distance b/t the electrodes and their surface area. According to ohm's law the current through conductors b/t 2 points is directly proportional to the potential difference across the 2 points.

APPARATUS:

Conducitivity meter, Small breaker.

REAGENTS:

Distilled water or de-ionized water.
0.01 M Standard Potassium chloride Solution (KCl)

PROCEDURE:

1) Rinse conductivity cell the 0.01 M KCl Solution. Calibrate the conductivity meter using the KCl reference solu to obtain cell constant.
2) Measure the electrical conductivity of 0.01 M KCl solu at room temperature.

CALCULATIONS

$C = KG$

For 0.01 N KCL solution the 'K' value is 1412

$EC = GS \times (mmho/cm)$

where GS = measured conductance of the given sample

The TDS of an unknown sample is calculated using the following relationship

$TDS\ (mg/l) = C \times EC\ (mmho/cm)$

where C is empirical constant

3) Rinse cell with sample and measure the electrical conductivity of the sample.
4) Rinse the cell with deionized water b/t samples.
5) Thoroughly rinse the cell in distilled water after measurement, keep it in distilled water when not in use.

RESULT:
Electrical conductivity = 217 (ms/cm, PPM)

INFERENCE:
The conductivity value gives us a rapid and inexpensive way of determining the ionic strength of the solution. This is an easy measurement to make and closely to the total dissolved solids content of water.

21/11/22

28/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO : 12

15/11/22

DETERMINATION OF TS, TDS and TSS, TVS

AIM:
To find the total, suspended, dissolved, volatile, fixed settleable solids present in the given sample.

APPARATUS:
Evaporating dishes/ Porcelain dish or crucible, drying oven, desiccator, weighing balance, whatman filter paper, muffle furnace.

PROCEDURE:
Total solids :
1) Dry evaporating dish at 104 ±1°C for 1 hour, cool and store in a desiccator.
2) weigh the dish immediately before use. Note down the weight as B.
3) Stir sample with a magnetic stirrer. while stirring, pipette a measured vol into the preweighed evaporating dish
4) Evaporate the sample to dryness in an oven at 104 ± 1°C If necessary add successive portions to the same dish after evaporation.

Total dissolved solids :
1) Measure the empty weight of porcelin dish and note down the reading as B.

OBSERVATION AND CALCULATION

1.) Total Solids, mg/L = $\frac{(A-B)}{V} \times 1000$

A = 38.630 g

B = 38.560 g

V = vol of sample (ml) = 25 ml

2.) Total dissolved solids, mg/L = $\left(\frac{A-B}{V}\right) \times 1000$

A = Final weight of dish = 38.070 mg

B = 38.06

V = 25 ml

3.) Total suspended solids, mg/L = $\left(\frac{C-D}{V}\right) \times 1000$

C = 0.670

D = 0.650

V = 25 ml

4.) Total volatile solids mg/L = $\left(\frac{A-B}{V}\right) \times 1000$

A = 38.630

B = 36

V = 25 ml

i) Total solids mg/l = 2.8 mg/l

ii) Total dissolved solids, mg/l = 0.4 mg/l

iii) Total suspended solids, mg/l = 1.6 mg/l

iv) Total volatile solids = 105.2 mg/l

	concentration (mg/l)
TS	2.8
TDS	0.4
TSS	1.6
TVS	105.2

2.) Take known quantity of sample and pass it through the filter paper and collect the filtrate.
3.) Dry the filtrate sample in oven at 103°c and cooled in a dessicator and note down the final weight as A.

Total Suspended Solids.
1.) Measure the empty weight of filter paper and note down reading as B.
2.) Dry the filter paper with filtered sample in oven at 103°c. Then cool it in a dessicator and note down the weight as C

Total volatile Solids.
1) keep the sample which is oven dried in muffle furnace at a temp 600°c for 1hr.
2.) cool the sample and notedown the final weight as D. This will give volatile solids.

RESULT:
1.) Total Solids (TS) = 2.8 mg/l
2.) Total dissolved solids (TDS) = 0.4 mg/l
3.) Total Suspended solids (TSS) = 1.6 mg/l
4.) Total volatile solids (TVS) = 105.2 mg/l

INFERENCE:
As per IS 10500: 1991 the desirable limit of total dissolved solids is 500 mg/l and permissible limit is 2000 mg/l. The obtained sample contains

dissolved solids in very low amount 0·4 mg/l. The sample can be used for conventional purpose.

16/11/22

27/30

Procedure	5
Conduction	10
Result	5
Viva	3
Record	4

HOD

EXPT NO : 13

29/11/22

DETERMINATION OF CHEMICAL OXYGEN DEMAND (COD)

AIM:
To determine the chemical oxygen (COD) of the given sample.

APPARATUS:
COD digestion vessel, COD digester, burette, pipette and beaker.

REAGENTS:
Standard Potassium dichromate solution
Sulphuric acid reagent
Ferroin indicator solution
Standard ferrous ammonium sulphate (FAS)

PROCEDURE:
1.) Take 2.5 ml of the sample in digestion vessel and add 1.5 ml of 0.25 N $K_2Cr_2O_7$ solution and 3.5 ml of Ag_2SO_4 + H_2SO_4 sol^n.
2.) Reflux the mixture on a hot plate/digester for 2 hrs at 150°c and cool the mixture to room temperature.
3) Titrate mixture against ferrous ammonium sulphate sol. using ferroin indicator till blue green colour turns to reddish brown colour. Note down the volume of FAS used as 'A' ml.

CALCULATION AND OBSERVATION

Sample	Burette Reading		Dilution factor	Vol of FAS consumed
	Initial	Final		
Hot blank	0	21.1	—	380
Diluted Sample	0	17.3	—	380
Hot blank	0	21.1	—	380
Diluted Sample	0	17.3	—	380

$$COD\ (mg/l) = \frac{[(B-A) \times M \times 8000]}{\text{vol of sample}}$$

A = FAS used for sample

B = FAS used for blank

M = Normality of FAS

$$COD = \frac{[(21.1 - 17.3) \times 0.25 \times 8000]}{20}$$

$$= 380\ ml$$

EXPT NO : 14

29/11/22

DETERMINATION OF OPTIMUM COAGULATION DOSAGE:

AIM:
To find the optimum amount of coagulant required to treat given water sample.

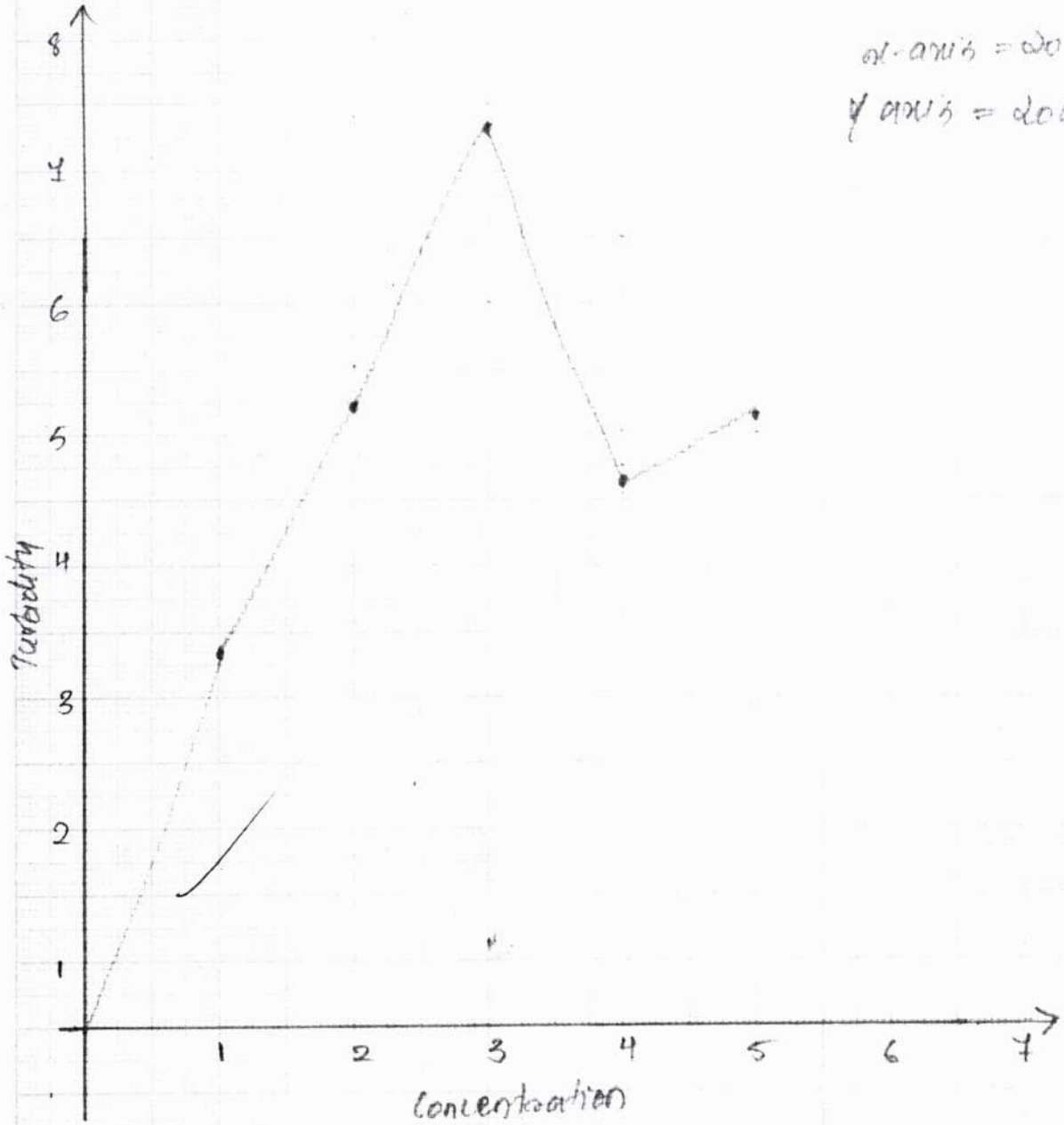
APPARATUS:
Jar test apparatus, turbid Meter, beakers, pipette and pH meter.

REAGENTS:
Alum, Ferric chloride

PROCEDURE:
1) Measure the initial turbidity of the given sample.
2) Find the pH of the sample and adjust it to 6 to 8.5.
3) Take 6 jars of 1L capacity & take 0.5 L of sample in each jar and add varying doses of alum to each one of them.
4) Keep the sample in jartest apparatus and put it for rapid mixing at 100 rpm for 1 min and then to slow mixing at 20 rpm for 20 min.
5) Stop the motor and allow the sample to settle for 30 min. Collect the supernatant from each jar and fill out the turbidity.

OBSERVATION AND CALCULATION

Concentration (ppm)	Turbidity (NTU)
1 ml alum	3.3
2 ml alum	5.8
3 ml alum	7.3
4 ml alum	4.6
5 ml alum	5.1


x-axis = 20 div = 1 PPM
y axis = 20 div = 1 NTU
Turbidity
Concentration
1
2
3
4
5
6
7
8

6.) Plot a graph with alum dosage along x-axis and turbidity along y-axis.

RESULT:
Optimum coagulant dosage = 3mg/l

INFERENCE:
The obtained coagulant dosage for given water sample is 3 having turbidity 7.3 NTU is 3 ml alum. This shows that water is not highly turbid.

20/11/22 27/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	5

HOD

RESULT:
The COD of the given water sample = 380 ml

INFERENCE:
As per ECP rules the COD of effluent should be less than 250 mg/l. If it is discharged to the inland water surface, Here the COD of sample is within the limit. So it can be discharged to the inland water surface.

26/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

EXPT NO: 15

6/12/22

86

DETERMINATION OF TOTAL COLIFORMS

AIM:
To determine the MPN content of the given water sample.

APPARATUS:
Test tubes of various capacities, Durham tube, pipette, incubator, measuring cylinder, beaker, dropper etc.

REAGENTS:
Appropriate culture medium.

PRINCIPLE:
Water to be tested is diluted serially and inoculated in lactose broth. Coliforms if present in water, utilize the lactose present in the medium to produce acid and gas. The presence of acid is indicated by colour change of the medium to produce and the presence of gas is detected as gas bubbles collected in the inverted durham tube present in the medium.

PROCEDURE:
Presumptive test:
1) Inoculate a series of fermentation tubes with appropriate

OBSERVATION AND CALCULATIONS

3 of distilled water	3 of 10 ml each	3 of 1ml each	3 of 0.1ml each	MPN/100ml
1	2	1	0	15
2	0	0	0	3
3	3	3	0	2410

$$MPN/100ml = \frac{\text{No of Positive test tube} \times 10}{\text{ml of sample in negative tubes} \times \text{ml of sample in all tubes}}$$

quantity of culture medium. Mix 5.36 g of Lauryl Tryptose in 50 ml of distilled water to prepare double strength medium and 3.75 g in 150 ml to prepare single strength solution.

2) Take 12 test tubes and sterilize all the glass waters to be used. Add 10 ml of single strength solution in other tubes.

3.) Put Durham tubes in inverted position and remove the air bubble in it if any by slightly tilting the test tube after capping it with sterilized cotton.

Confirmed test :

1.) Brilliant green lactose broth is used for the confirmed test. BGLB media is prepared by dissolving 8 g of BGLB in 200mL of distilled water.

2) Add 1ml of distilled water in 1st 3 tubes which is taken as control. Then transfer the medium in the positive tubes of the presumptive test to the BGLB tubes.

2.) Incubate the inoculated tubes for 48 ± 3 hrs at 37°C.

RESULT :

The value of MPN / 100ml is = 240 //

26/30

Procedure	5
Conduction	10
Result	4
Viva	3
Record	4

HOD

completed All experiments

Staff in charge : Revathi - P

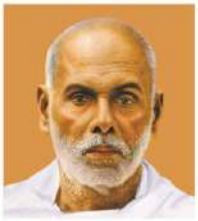
HOD

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

Est. 2003

Sree Narayana Guru College of Engineering & Technology

CHALAKKODE P.O., KOROM, PAYYANUR, KANNUR-670 307



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY, PAYYANUR

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

THIRD SEMESTER

LAB RECORD

CSL203 OBJECT ORIENTED PROGARMMING LAB (IN JAVA)

HOD/ISE

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY,
A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY, KERALA.

LAB RECORD

CSL203 OBJECT ORIENTED PROGARMMING LAB (IN JAVA)

Name: UTHARA M.V

Semester: 3

Registration No. SN.L2.16.S044

Certified that this is the bonafide record of the work done in "CSL203 Object Oriented Programming Laboratory in java" of Department of Computer Science and Engineering at Sree Narayana Guru College of Engineering and Technology, Payyanur, Kannur by

Mr./Ms. Uthara M.V

for the award of the Degree of Bachelor of Technology in Computer Science & Engineering of A P J Abdul Kalam Technological University, Kerala

Staff in-charge 3/12/22

Head of the Department 29/12/2022

Place: Payyanur

Date: 3/12/22

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

Internal Examiner 20/2/23

External Examiner 20/2/23

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE DEPARTMENT

To be a centre of excellence in Computer Science and Engineering to produce competent professionals and entrepreneurs capable of exploring and assimilating latest technological advancements for the betterment of the society.

MISSION OF THE DEPARTMENT

- To facilitate transformative education in computer science and engineering.
- To build competent professionals and entrepreneurs by introducing newtechnologies.
- To accomplish higher education, induce ethical values and spirit of socialcommitment.

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To prepare students to excel in Computer Science and Engineering programme through quality education enabling them to succeed in computing industryprofession.

PEO2: To provide students with core competencies by strengthening their mathematical, scientific and basic engineering fundamentals.

PEO3: To design & develop novel products and innovative solutions for real life problems in Computer Science & Engineering field and related domains by broad based knowledge.

PEO4: To inculcate professionalism among students by providing technical, entrepreneurial skills and soft skills with ethical standards.

PEO5: To encourage students for higher studies by adapting to new technologies through interactive quality teaching and organizing symposiums, conferences, seminars, workshops and technical discussions.

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering Fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics andresponsibilities and norms of the engineering practice.

9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and abilityto engage in independent and life-long learning in the technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Computer Science Specific Skills: The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by understanding the core principles and concepts of computer science.

PSO2: Programming and Software Development Skills: The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products.

HOD/USE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SYLLABUS

CSL203	OBJECT ORIENTED PROGRAMMING LAB (IN JAVA)	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		PCC	0	0	3	2	2019

Preamble: The aim of the course is to provide hands-on experience to the learners on various object-oriented concepts in Java Programming. This course helps the learners to enhance the ca- ability to design and implement various Java applications for real world problems.

Prerequisite: Topics covered under the course Programming in C (EST 102)

Course Outcomes:

After the completion of the course the student will be able to

CO1	Implement the Object-Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level: **Apply**)
CO2	Implement programs in Java which use data types, operators, control statements, built in packages & interfaces, Input/output streams and Files (Cognitive Knowledge Level: **Apply**)
CO3	Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: **Apply**)
CO4	Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: **Apply**)
CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: **Apply**)

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓	✓			✓		✓		✓
CO2	✓	✓	✓	✓	✓			✓		✓		✓
CO3	✓	✓	✓	✓	✓			✓		✓		✓
CO4	✓	✓	✓	✓	✓			✓		✓		✓
CO5	✓	✓	✓	✓	✓			✓		✓		✓

Abstract Pos defined by National Board Of Accreditation			
PO #	**Broad PO**	**PO #**	**Broad PO**
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and teamwork
PO4	Conduct investigations of complex problems	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Lifelong learning

Assessment Pattern:

Bloom's Category	**Continuous Assessment Test (Internal Exam) Markin Percentage**	**End Semester Marks in percentage**
Remember	20	20
Understand	20	20
Apply	60	60
Analyze		
Evaluate		
Create		

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	75	75	3 hours

Continuous Internal Evaluation Pattern:

Attendance	:	15
Marks Continuous Evaluation in Lab	:	30
Marks Continuous Assessment Test	:	15
Marks Viva Voce	:	15

Internal Examination Pattern: The marks will be distributed as Algorithm 30 marks, Program 20 marks, Output 20 marks and Viva 30 marks. Total 100 marks which will be converted out of 15 while calculating Internal Evaluation marks.

End Semester Examination Pattern: The marks will be distributed as Algorithm 30 marks, Program 20 marks, Output 20 marks and Viva 30 marks. Total 100 marks will be converted out of 75 for End Semester Examination.

Operating System to Use in Lab: Linux

Compiler/Software to Use in Lab: gcc, javac, jdk, jre, Eclipse, NetBeans, MySQL/PostgreSQL.

Programming Language to use in Lab: Java

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

LIST OF EXPERIMENT

CYCLE - 1

1. Write a Java Program to find the frequency of a given character in a string.

2. Write a Java program to multiply two given matrices.

CYCLE - 2

3. Write a Java program which creates a class named 'Employee'

4. Write a java program to create an abstract class.

5. Write a Java program that read from a file and write to file by handling allfile related exceptions.

6. Write a Java program that reads a line of integers, and then displays eachinteger, and the sum of all the integers.

7. Write a Java program that shows the usage of try, catch, throws and finally.

8. Write a Java program that shows thread synchronization.

9. Write a Java program that works as a simple calculator.

10. Write a Java program that simulates a traffic light.

CYCLE - 3

11. Write a Java program for doubly linked list operations.

12. Write a Java program that implements Quick sort algorithm

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD/ISE

PRACTICE QUESTIONS

1) Write a Java program to reverse an given string.

2) Write a Java program to display the transpose of a given matrix.

3) Write a Java program to find the second smallest element in an array.

4) Write a Java program to check whether a given number is prime or not.

5) Write a Java program to calculate the area of different shapes namely circle, rectangle, and triangle using the concept of method overloading.

6) Write two Java classes Employee and Engineer. Engineer should inherit from Employee class. Employee class to have two methods display() and calcSalary().Write a program to display the engineer salary and to display from Employee class using a single object in- stantiation (i.e., only one object creation is allowed).
   - display() only prints the name of the class and does not return any value. Ex. " Name of class is Employee."
   - calcSalary() in Employee displays "Salary of employee is 10000" and calcSalary() in Engineer displays "Salary of employee is 20000."

7) Write a Java program to illustrate Interface inheritance.

8) Write a Java program that shows how to create a user-defined exception.

9) Write a Java program to create two threads: One for displaying all odd number between 1 and 100 and second thread for displaying all even numbers between 1 and 100.

10) Write a Java program that shows thread priorities.

11) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

12) Write a Java program that displays the number of characters, lines and words in a text file.

13) Write a Java program for handling mouse events.

14) Write a Java program for handling key events using Adapter classes (general).

15) Write a Java program that allows the user to draw lines, rectangles and ovals.

16) Write a Java Swing program to print a wave form on the output screen.

17) Write a program to accept roll no, name, CGPA of "n" students and store the data to a database using JDBC connectivity. Display the list of students having CGPA greater than (Use MySQL /PostgreSQL).

18) Write a Java program to implement Heap sort algorithm using array.

19) Write a Java program that checks whether a given string is a palindrome or not. Ex:MALAYALAM is palindrome.

20) Write a Java program to demonstrate the use of garbage collector.

21) Write a file handling program in Java with reader/writer Write a Java program that implements a multi-threaded program which has three threads. First thread generates a random integer every 1 second. If the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.

22) Write a Java program to display all records from a table using Java Database Connectivity (JDBC).

23) Write a Java program that implements the binary search algorithm.

HOD/USE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

INDEX

Sl No.	Experiment	Date	Page No.	Mark	Remarks
1	Java Program to find the frequency of a given character in a string.	14/09/22	3	48	16/9/22
2	Java program to multiply two given matrices.	14/09/22	11	47	16/9/22
3	Java program which creates a class named 'Employee'	15/09/22	21	46	16/9/22
4	Java program to create an abstract class.	29/09/22	29	46	
5	Java program that read from a file and write to file by handling all file related exceptions	16/10/22	37	47	21/10/22
6	Java program that reads a line of integers, and then displays each integer, and the sum of all the integers.	26/10/22	45	46	26/10/22
7	Java program that shows the usage of try, catch, throws and finally.	26/10/22	53	46	26/10/22
8	Java program that shows thread synchronization.	27/10/22	61	47	27/10/22
9	Java program that works as a simple calculator.	3/11/22	69	45	3/11/22
10	Java program that simulates a traffic light.	10/11/22	77	47	10/11/22
11	Java program for doubly linked list operations.	17/11/22	87	46	17/11/22
12	Java program that implements Quick sort algorithm	30/11/22	95	47	2/12/22

HOD/CSE

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

PROGRAM & OUTPUT

PROGRAM :-

```
import java.util.Scanner;
public class Frequency
{
public static void main(String[]args)
{
Scanner sc=new Scanner (System.in);
System.out.println("Enter The String:");
String str=sc.nextLine();
System.out.print("Enter The Character:");
char  ch=sc.nextLine().charAt(0);
 int count=0;
for(int i=0;i<str.length();i++)
{
if(str.charAt(i)==ch)
{
count++;
}
}
System.out.println("Count Of Occurance Of "+ch+"="+count );
}
}
```

OUTPUT :-

```
Enter The String:
hello world
Enter TheCharacter:o
Count Of Occurance Of o=2
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 1
Date: 14/09/22

Java Program to find the frequency of a given character in a string

AIM

Write a java_programs to find the frequency of a given character in a string using data types, operators, and control statements in Java.

ALGORITHM / PROCEDURE

Step 1 :- start

Step 2 :- import java utility package including Scanner class

Step 3 :- Defining class frequency

Step 4 :- Define main function

Step 5 :- int i = 0, count = 0, char ch, string str ;

Step 6 :- Create an instance for scanner to read input

Step 7 :- print " Enter the word".

Step 8 :- Read the string and assign to str.

Step 9 :- print " Enter the character to check ".

Step 10 :- Read the character and assign it to ch

Step 11 :- If (i < length of string str) go to step 12 else go to step 15.

Step 12 :- If (str.charAt(i) == ch) go to step 13, else go to step 14

Step 13 :- count ++

Step 14 :- i ++, go to step 11

Step 15 :- print count of occurance of " + ch + " is " + count ;

Step 16 :- Stop.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	To
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	8
Total	**50**	48

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

r-3	Total
gorithm lly :t	10
code is rly nized.	10
: program ee of rs but duces in urate ults.	10
t ndardized l well kept o. Some ries are perfect.	10
tal Marks	40

RESULT

Output obtained successfully and verified

10/9/22

HOD/ISE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM :-

```
import java.util.Scanner;
class Matrix
{
 public static void main(String args[])
 {
  Scanner sc=new Scanner(System.in);
  System.out.print("Enter the order-m1:");
  int m1=sc.nextInt();
  System.out.print("Enter the order-n1:");
  int n1=sc.nextInt();
  System.out.print("Enter the order-m2:");
  int m2=sc.nextInt();
  System.out.print("Enter the order-n2:");
  int n2=sc.nextInt();
  if(n1!=m2)
  {
   System.out.println("Matrix Multiplication not possible");
   return;
  }
  int A[][]=new int[m1][n1];
  int B[][]=new int[m2][n2];
  int C[][]=new int[m1][n2];
  System.out.println("Read Matrix A");
  for(int i=0;i<m1;i++)
  {
   for(int j=0;j<n1;j++)
   {
    System.out.print("A["+i+"]["+j+"]=");
    A[i][j]=sc.nextInt();
   }
  }
  System.out.println("Read Matrix B");
  for(int i=0;i<m2;i++)
  {
   for(int j=0;j<n1;j++)
   {
    System.out.print("B["+i+"]["+j+"]=");
    B[i][j]=sc.nextInt();
   }
  }
   for(int i=0;i<m1;i++)
   {
    for(int j=0;j<n2;j++)
    {
     C[i][j]=0;
     for(int k=0;k<n1;k++)
     {
      C[i][j]+=A[i][k]*B[k][j];
     }
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 2
Date: 14/09/22

Java Program to multiply two given matrices

AIM

Write a Java program to multiply two given matrices using data types, operators, and control statements in Java.

ALGORITHM / PROCEDURE

Step 1 :- Start

Step 2 :- Import java utility package including scanner class

Step 3 :- Defining class ~~Test~~ Matrix

Step 4 :- Define main function

Step 5 :- Initialize integer $k, i, j, m_1, m_2, n_1, n_2$, a[][], b[][] c[][]

Step 6 :- create an instance for the Scanner to read the input

Step 7 :- Print 'Enter order m1'

Step 8 :- Read value to m1

Step 9 :- Print "Enter order n1'

Step 10 :- Read value to n1

Step 11 :- Print 'Enter order m2'

Step 12 :- Read value to m_2

Step 13 :- Print 'Enter order n2'

Step 14 :- Read value to n_2

Step 15 :- if ($n_1 \neq m_2$) print "operation not impossible" then go to step else go to step 16

Step 16 :- Assign

A[][] = new int [m_1][n_1]

B[][] = new int [m_2][n_2]

C[][] = new int [m_1] [n_2]

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

```
 }
}
System.out.println("Matrix A");
for(int i=0;i<m1;i++)
{
 for(int j=0;j<m1;j++)
 {
  System.out.print(A[i][j]+"\t");
 }
 System.out.println();
}
System.out.println("Matrix B");
for(int i=0;i<m2;i++)
{
 for(int j=0;j<n2;j++)
 {
  System.out.print(B[i][j]+"\t");
 }
 System.out.println();
}
System.out.println("Matrix C");
for(int i=0;i<m1;i++)
{
 for(int j=0;j<n2;j++)
 {
  System.out.print(C[i][j]+"\t");
 }
 System.out.println();
}
}
}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Step 17 :- print " Enter elements of matrix A "

Step 18 :- $i = 0, j = 0$

Step 19 :- If ($i < m_1$) go to step 20, else goto step 24.

Step 20 :- If ($j < n_1$) go to step 21, else goto step 23

Step 21 :- Read A[i][j]

Step 22 :- j++, go to step 20

Step 23 :- i++, go to step 19

Step 24 :- $i = 0, j = 0$

Step 25 :- print " Enter element to matrix B "

Step 26 :- If ($i < m_2$) go to step 27, else go to step 31

Step 27 :- If ($j < n_2$) go to step 28, else go to step 30.

Step 28 :- Read [i][j]

Step 29 :- j++, go to step 27

Step 30 : i++, go to step 26.

Step 31 : $i = 0, j = 0, k = 0$

Step 32 : If ($i < m_1$) go to step 33, else go to 40.

Step 33 : If ($j < n_2$) go to step 34, else go to 39.

Step 34 : C[i][j] = 0

Step 35 : If ($k < m_1$) go to step 36, else go to step 40

Step 36 : C[i][j] = A[i][k] * B[k][j]

Step 37 : k++, go to step 35

Step 38 : j++, go to step 33

Step 39 : i++, go to step 32

Step 40 : print C[][]

Step 41 : Stop.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

OUTPUT :-

```
Enter the order-m1:2
Enter the order-n1:2
Enter the order-m2:2
Enter the order-n2:2
Read Matrix A
A[0][0]=55
A[0][1]=6
A[1][0]=7
A[1][1]=1
Read Matrix B
B[0][0]=5
B[0][1]=4
B[1][0]=88
B[1][1]=324
Matrix A
55      6
7       1
Matrix B
5       4
88      324
Matrix C
803     2164
123     352
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	To
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	7
Total	**50**	47

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

oor-3	Tota
ılgorithm t ally ct	10
:ode is y ıized.	10
›rogram e of ; but ıces in ate s.	10
ardized vell kept Some :s are :fect.	10
l Marks	40

Result

Output obtained and verified successfully

16/9/22

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

CYCLE - 2

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM :-

```
import java.util.Scanner;
class Employee
{
private String name;
private int age;
private long phoneNO;
private String address;
private double salary;
public void setName(String name)
{
this.name=name;
}
public void setAge(int age)
{
this.age=age;
}
public void setPhoneNO(long phoneNO )
{
this.phoneNO=phoneNO;
}
public void setAddress(String address)
{
this.address=address;
}
public void setSalary(double salary)
{
this.salary=salary;
}
public double printSalary()
{
return salary;
}
public String getName()
{
return name;
}
public int getAge()
{
return age;
}
public String getAddress()
{
return address;
}
public long getPhoneNO()
{
return phoneNO;
}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 3
Date: 15/09/22

Java Program Which Creates a Class Named 'Employee'

AIM

Write a Java program which creates a class named 'Employee' having the following members: Name, Age, Phone number, Address, Salary. It also has a method named 'print Salary ()' which prints the salary of the Employee. Two classes 'Officer' and 'Manager' inherit the 'Employee' class. The 'Officer' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an officer and a manager by making an object of both of these classes and print the same. (Exercise to understand inheritance).

ALGORITHM / PROCEDURE

Step 1:- Start

Step 2:- import utity package

Step 3:- Creat a class Employee in that initialize private data variable such as name, age, phone number, address, salary

Step4:- Accept data from the user by using methods

Step4.1:- Use method SetName(String name) to accept the name from user.

Step 4.2:- Use method Set Age(int age) to accept the ~~name~~ age from user

Step4.3:- Use ~~method~~ setphonenumber(long phone number) ~~to~~ accept phone number from user.

Step4.4: Use method setAddress(String Address) to accept address from user

Step4.5:- Use method setsalary(double Salary) to accept the salary from user.

Step 5: From Step 4.1 to 4.5 accepting data in a syntax format using this keyword to the current class instance

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

```
}
class Officer extends Employee
{
private String specialization;
private String department;
public void setSpecialization(String specialization)
{
this.specialization=specialization;
}
public void setDepartment(String department)
{
this.department=department;
}
public String getDepartment()
{
return department;
}
public String getSpecialization()
{
return specialization;
}
}
class Manager extends Employee
{
private String specialization;
private String department;
public void setSpecialization(String specialization)
{
this.specialization=specialization;
}
public void setDepartment(String department)
{
this.department=department;
}
public String getDepartment()
{
return department;
}
public String getSpecialization()
{
return specialization;
}
}
class Test{
public static void main(String[]args)
{
Scanner sc=new Scanner(System.in);
Officer o=new Officer();
System.out.println("ENTER THE OFFICER'S DETAIL");
System.out.print("NAME:");
o.setName(sc.nextLine());
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Step 6:- Create public double print Salary() to return the salary.

Step 6.1:- public String getName() to return the Name which accept from the user.

Step 6.2: public int getAge() to return the Age which is accepted from the user

Step 6.3: public String getAddress() to return the address which is accepted from the user.

Step 6.4:- public long getphoneNumber() to return the phonenumber which is accepted from the user.

Step 7:- close the Employee class.

Step 8:- create a class Officer using extends keyword by inheriting the properties for the class employee.

Step 9:- Initialize private variable such as String specification and department.

Step 10:- Use method set specification (String specification) to accept the data from the user.

Step 10.1:- Use methode set department (String department) to accept the data from user.

Step 11:- Use this keyword to show the current class and initialize both step 10 and step 10.1.

Step 12:- public string get department() to return the accepted data from the user.

Step 12.1: public string get specification() to return the accepted data from the user.

Step 13:- close the class Officer.

Step 14:- create class Manger which extends the properties from employee class.

Step 15:- Initialize private String specification and String department.

Step 16:- Repeat from step 10 to step 15.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

```
System.out.print("ADDRESS:");
o.setAddress(sc.nextLine());
System.out.print("SPECIALIZATION:");
o.setSpecialization(sc.nextLine());
System.out.print("DEPARTMENT:");
o.setDepartment(sc.nextLine());
System.out.print("AGE:");
o.setAge(sc.nextInt());
System.out.print("NUMBER:");
o.setPhoneNO(sc.nextLong());
System.out.print("SALARY:");
o.setSalary(sc.nextDouble());
sc.nextLine();
System.out.println("THE OFFICER DETAIL");
System.out.println("NAME:"+o.getName());
System.out.println("AGE:"+o.getAge());
System.out.println("NUMBER:"+o.getPhoneNO());
System.out.println("ADDRESS:"+o.getAddress());
System.out.println("SALARY:"+o.printSalary());
System.out.println("SPECIALIZATION:"+o.getSpecialization());
System.out.println("DEPARTMENT:"+o.getDepartment());

Manager m=new Manager();
System.out.println("ENTER THE MANAGER'S DETAIL");
System.out.print("NAME:");
m.setName(sc.nextLine());
System.out.print("ADDRESS:");
m.setAddress(sc.nextLine());
System.out.print("SPECIALIZATION:");
m.setSpecialization(sc.nextLine());
System.out.print("DEPARTMENT:");
m.setDepartment(sc.nextLine());
System.out.print("AGE:");
m.setAge(sc.nextInt());
System.out.print("NUMBER:");
m.setPhoneNO(sc.nextLong());
System.out.print("SALARY:");
m.setSalary(sc.nextDouble());
sc.nextLine();

System.out.println("THE MANAGER'S DETAIL");
System.out.println("NAME:"+m.getName());
System.out.println("AGE:"+m.getAge());
System.out.println("NUMBER:"+m.getPhoneNO());
System.out.println("ADDRESS:"+m.getAddress());
System.out.println("SALARY:"+m.printSalary());
System.out.println("SPECIALIZATION:"+m.getSpecialization());
System.out.println("DEPARTMENT:"+m.getDepartment());
}
}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Step 17:- close the manager class

Step 18:- create new class test which has main function in it

Step 19:- create object

Scanner sc= newScanner(System.in) to read the input from user officer o = new officer();

Manager m = new manager();

Step 20:- Display all the necessary statement such as officer details, name, age, phone number address, specification, department using printing statement for both officer detail and manager detail.

Step 21:- call them using objects to display it

Step 22:- Stop.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Tot
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation *time is not* minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time *to compute*	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	4

CRITERIA		MARKS
Performance	40	40
Viva	10	6
Total	**50**	46

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

	Total
thm	10
is	10
am n	10
ed cept e	10
rks	40

Result

Output obtained and verified successfully

16/9/22

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM :-

```
abstract class Shape
{
        public abstract void numberOfSides();
}

class Rectangle extends Shape
{
        public void numberOfSides()
{
                System.out.println("Number of sides = 4");
        }
}

class Triangle extends Shape
{
        public void numberOfSides()
{
                System.out.println("Number of sides = 3");
        }
}

class Hexagon extends Shape
{
        public void numberOfSides()
{
                System.out.println("Number of sides = 6");
        }
}

class Abstractcls
{
        public static void main(String args[])
{
                Rectangle r = new Rectangle();
                Triangle t  = new Triangle();
                Hexagon h   = new Hexagon();
                r.numberOfSides();
                t.numberOfSides();
                h.numberOfSides();
        }
}
```

OUTPUT :-

```
Number Of Sides = 4
Number Of Sides = 3
Number Of Sides = 6
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Hexagon : Hexagon h = new hexagon ();

Step 15 :- call all the method

r. numberofsides()

t numberofsides()

h numberofsides()

Step 16 :- close the main function and close the class

Step 17 :- Stop.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Tota
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	6
Total	**50**	46

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

'oor-3	Total
algorithm :t ally :ct	10
code is ly nized.	10
program :e of rs but luces in irate lts.	10
dardized well kept . Some ies are erfect.	10
al Marks	40

Result

Output obtained and verified successfully

10/10/22

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

```
import java.io.FileWriter;
import java.io.FileReader;
import
java.io.IOException;

class ReadWriteFile{
    public static void
main(String args[]) throws
IOException {
        int ch;
    FileReader fr = new
FileReader("source.txt");
    FileWriter fw = new
FileWriter("destination.tx
t");

    while((ch = fr.read()) !
= -1){

System.out.print((char)ch)
;
    fw.write((char)ch);
        }
    fr.close();
    fw.close();
    }
}
```

OUTPUT

Java is a high level programming l
an object oriented langu

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 5
Date: 16/10/22

Java program that read from a file and write to file by handling all file related exceptions

AIM

Write a Java program that read from a file and write to file by handling all file related exceptions.

ALGORITHM / PROCEDURE

Step 1:- Start

Step 2:- import package
File writer
File reader
Exception

Step 3:- Create class Read Writer File which contains main function.

Step 4:- Initialize integer ch.

Step 5:- Create objects
File Reader Fr = new FileReader("Sample.txt");
File Writer Fw = new FileWriter("new ~~sample~~ destination.txt");

Step6:- While ((char ch = fr.read()) != -1)

Step6.1:- print((char) ch);

Step6.2:- fw.write((char) ch);

Step 7:- close objects fr and fw

Step 8:- Stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

```
import java.io.FileWriter;
import java.io.FileReader;
import
java.io.IOException;

class ReadWriteFile{
public static void
main(String args[]) throws
IOException {
int ch;
FileReader fr = new
FileReader("source.txt");
FileWriter fw = new
FileWriter("destination.tx
t");

while((ch = fr.read()) !
= -1){

System.out.print((char)ch)
;
fw.write((char)ch);
}
fr.close();
fw.close();
}
}
```

OUTPUT

Java is a high level programming language.It is
an object oriented language

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Tot
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	7
Total	**50**	47

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

-3	Total
rithm	10
: is d.	10
gram t in	10
ized kept ne e t.	10
arks	40

Result

Output obtained and verified successfully

21/10/22

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

PROGRAM :-

```
import java.util.*;

class StringTokenizerDemo
{
        public static void main(String args[])
{
                int n,sum=0;
                Scanner scan = new Scanner(System.in);
                System.out.println("Enter integers with one space gap :")

                String s = scan.nextLine();
                StringTokenizer st = new StringTokenizer(s," ");

                while(st.hasMoreTokens())
{
                        String temp = st.nextToken();
                        n = Integer.parseInt(temp);
                        System.out.println(n);
                        sum += n;
                }
                System.out.println("Sum of integers :" +sum);
        }
}
```

OUTPUT :-

Enter integers with one space gap :

1 5 9

Sum of integers : 15

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 6
Date: 26/10/22

Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers

AIM

Write a Java program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util).

ALGORITHM / PROCEDURE

Step 1 :- Start
Step 2 :- Import scanner class
Step 3 :- Create class string to kenier demo which contain main function
Step 4 :- Initialize integer n, sum = 0
Step 5 :- Create object sc
Scanner sc = new Scanner (System.in);
Step 6 :- print Enter integer with one space gap
Step 7 :- Read string to strings
Step 8 :- Create object st;
String to kennizer s1 = new string to kenizer(s1)
Step 9 :- While (st has more to tocken(), else go to step 14
Step 10 :- String temp = st. next token()
Step 11 :- n = (convert to integer type (temp);
Step 12 :- print (n);
Step 13 :- sum = sum + n, go to step 9
Step 14 :- print("Sum of integer 5" + sum
Step 15 :- close object
Step 16 :- Stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Total
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	6
Total	**50**	46

Result

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

-3	Total
rithm	10
e is d.	10
gram f ut s in :	10
lized l kept me ure ct.	10
larks	40

Result

output obtained and verified successfully

26/10/22

HOD/USE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

PROGRAM :-

```
import java.util.Scanner;
class exception
{
public static void main(String args[])
{
Scanner sc = new Scanner(System.in);
try{
System.out.println("Program to perform Division");
System.out.print("Enter Number-1:");
int a = sc.nextInt();
System.out.print("Enter Number-2:");
int b = sc.nextInt();
int c = a/b;
System.out.println("Result="+c);
}
catch(ArithmeticException e)
{
System.out.println(e.getMessage());
}
finally{
System.out.println("End of Operation");
}
}
}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 7
Date: 26/10/22

Java Program that shows the usage of Try, Catch, Throws and Finally

AIM

Write a Java program that shows the usage of try, catch, throws and finally.

ALGORITHM / PROCEDURE

Step 1 :- Start
Step 2 :- Import Scanner from util class
Step 3 :- Initiate class exception
Step 4 :- Initiate main function
Step 5 :- Initiate object scan of scanner class
Step 6 :- With try keyword initiate and begin code block to be ~~begin~~ executed.
Step 6.1 :- Read the two number and store in variable a and b
Step 6.2 :- divide a by b and store result in variable c and print result
Step 7 :- With catch keyword look for arithmatic exception and if found store in variable e
Step 7.1 :- In case of exception display message with getmessage() method
Step 8 :- With finally keyword display message "End of program to be executed at end unconditionally
Step 9 :- close exception class
Step 10 :- Stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

OUTPUT :-

Program to perform Division

Enter Number-1:10

Enter Number-2:5

Result =2

End of Operation

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Total
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	6
Total	**50**	46

Result

Output

26/10

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

	Total
ım	10
	10
m ı	10
ed ept	10
ks	40

Result

Output obtained and verified successfully.

26/10/22

HOD/USE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

PROGRAM :-

```
class Display
{
	public synchronized void print(String msg)
	{
		System.out.print("["+msg);
		try
		{
			Thread.sleep(1000);
		}
		catch(Exception e)
		{
			System.out.println(e.getMessage());
		}
		System.out.println("]");
	}
}

class SyncThread extends Thread
{
	private Display d;
	private String msg;
	public SyncThread(Display d,String msg)
	{
		this.d=d;
		this.msg=msg;
	}
	public void run()
	{
		d.print(msg);
	}
}

class Test2
{
	public static void main(String[] args)
	{
		Display d=new Display();
		SyncThread t1=new SyncThread(d,"Hello");
		SyncThread t2=new SyncThread(d,"World");
		t1.start();
		t2.start();
	}
}
```

OUTPUT :-

[Hello]

[World]

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 8
Date: 27/10/22

Java Program that shows Thread Synchronization

AIM

Write a Java Program that shows Thread Synchronization

ALGORITHM / PROCEDURE

Step 1:- start

Step 2:- Define a class Display

Step 3:- Define a synchronized public function print taking a string parameter message that print the message

Step 4:- Within Try block call Step method of thread class with parameter as 1000

Step 5:- catch only exception and return the error message

Step 6:- close Display class

Step 7:- Define a close synchthread inheriting Thread class

Step 8:- Initialize private objects display it and string message

Step 9:- Define a constructor with Display at and string message as parameter and assign their values to defined in step 8

Step 10:- Define a method run to print message

Step 11:- close synchthread class

Step 12:- Define class Test 2

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Step 13:- Define main function and include instance of display t_1 and t_2 of synchthread with , Hello and d world as parameter respectively.

Step 14:- call start method of 11 and 12 respectively

Step 15:- close class Test 2

Step 16:- Stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Total
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	7
Total	**50**	47

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Total
10
10
10
10
40

Result

Output obtained and verified successfully.

27/10/22

HOD/ISE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

PROGRAM:-

```
import javax.swing.*;
import java.awt.event.*;
class Calculator extends JFrame implements ActionListener{
private JTextField t1;
private JButton b1;
private JButton b2;
private JButton b3;
private JButton b4;
private JButton b5;
private JButton b6;
private JButton b7;

private JButton b8;
private JButton b9;
private JButton b10;
private JButton b11;
private JButton b12;
private JButton b13;
private JButton b14;
private JButton b15;
private JButton b16;
private Integer res;
private String operation;
public Calculator()
{
setLayout(null);
setSize(640,480);
t1 = new JTextField();
t1.setBounds(100,100,200,30);
b1 = new JButton("1");
b1.setBounds(100,140,50,30);
b2 = new JButton("2");
b2.setBounds(150,140,50,30);
b3 = new JButton("3");
b3.setBounds(200,140,50,30);
b4 = new JButton("+");
b4.setBounds(250,140,50,30);
// Third Row
b5 = new JButton("4");
b5.setBounds(100,170,50,30);
b6 = new JButton("5");
b6.setBounds(150,170,50,30);
b7 = new JButton("6");
b7.setBounds(200,170,50,30);
b8 = new JButton("-");
b8.setBounds(250,170,50,30);
// Fourth Row
b9 = new JButton("7");
b9.setBounds(100,200,50,30);
b10 = new JButton("8");
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Progr
Date:

AIM

ALGOI

PROGRAM & OUTPUT

```
b10.setBounds(150,200,50,30);
b11 = new JButton("9");
b11.setBounds(200,200,50,30);
b12 = new JButton("*");
b12.setBounds(250,200,50,30);
// Fourth Row
b13 = new JButton("/");
b13.setBounds(100,230,50,30);
b14 = new JButton("%");
b14.setBounds(150,230,50,30);
b15 = new JButton("=");
b15.setBounds(200,230,50,30);
b16 = new JButton("C");
b16.setBounds(250,230,50,30);

add(t1);add(b1);add(b2);
add(b3);add(b4);add(b5);
add(b6);add(b7);add(b8);
add(b9);add(b10);add(b11);
add(b12);add(b13);add(b14);
add(b15);add(b16);
b1.addActionListener(this);b2.addActionListener(this);
b3.addActionListener(this);b4.addActionListener(this);
b5.addActionListener(this);b6.addActionListener(this);
b7.addActionListener(this);b8.addActionListener(this);
b9.addActionListener(this);b10.addActionListener(this);
b11.addActionListener(this);b12.addActionListener(this);
b13.addActionListener(this);b14.addActionListener(this);
b15.addActionListener(this);b16.addActionListener(this);
}
public void doAction(String op)
{
if(operation == null)
{
operation = op;
res = Integer.parseInt(t1.getText());
t1.setText("");
}
else{
switch(operation)
{
case "+": res = res + Integer.parseInt(t1.getText());

break;

case "-": res = res - Integer.parseInt(t1.getText());

break;
case "/": try{

if(t1.getText().equals("0"))
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Progr
Date:

AIM

ALGOI

Program No: 9
Date: 3/11/22

Java Program that works as a Simple Calculator

AIM

Write a Java program that works as a simple calculator. Arrange Buttons for digits and the + - * % operations properly. Add a text field to display the result. Handle any possible exceptions like divide by zero. Use Java Swing.

ALGORITHM / PROCEDURE

1. Start
2. Create an object of the JFrame class and set some of its properties like its title layout property etc. using the method of JFrame class
3. Now create another Java class and inside the main method just create an object of our calculator class
4. Create object of all the components that we won't to add
5. After creating object of all the components set some of the properties of each component After setting their properties add them to the frame using add() method.
6. Implement the ActionListner interface in our class and override its method ActionPerformed() in that class
7. Register ActionListner for all the [illegible]
8. Inter values to perform op[illegible]

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

```
{
throw new

ArithmeticException("Divide by Zero");

}
res = res / Integer.parseInt(t1.getText());
}
catch(ArithmeticException e)
{
t1.setText(e.getMessage());
operation = null;
res = 0;
}
break;

case "*": res = res * Integer.parseInt(t1.getText());

break;

case "%": res = res % Integer.parseInt(t1.getText());

break;

}
if(op.equals("=")){
t1.setText(res.toString());

res = 0;
operation = null;
}
else{
operation = op;
t1.setText("");
}
}
}
public void actionPerformed(ActionEvent e){
if(e.getSource()== b1)
t1.setText(t1.getText()+"1");
else if(e.getSource()== b2)
t1.setText(t1.getText()+"2");
else if(e.getSource()== b3)
t1.setText(t1.getText()+"3");
else if(e.getSource()== b5)
t1.setText(t1.getText()+"4");
else if(e.getSource()== b6)
t1.setText(t1.getText()+"5");
else if(e.getSource()== b7)
t1.setText(t1.getText()+"6");
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

```
else if(e.getSource()== b9)
t1.setText(t1.getText()+"7");
else if(e.getSource()== b10)
t1.setText(t1.getText()+"8");
else if(e.getSource()== b11)
t1.setText(t1.getText()+"9");
else if(e.getSource()== b16){
t1.setText("");
res =0;
operation = null;
}
else if(e.getSource()== b4){
doAction("+");
}
else if(e.getSource()== b8)
doAction("-");
else if(e.getSource()== b12)
doAction("*");
else if(e.getSource()== b13)
doAction("/");
else if(e.getSource()== b14)
doAction("%");
else if(e.getSource()== b15)
doAction("=");

}
public static void main(String args[]){
new Calculator().setVisible(true);
}

}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

calculator

9. stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Total
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	5
Total	**50**	45

Result

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

	Total
hm	10
s	10
m n	10
ed ept :	10
ks	40

Result

Output obtained and verified successfully

3/11/22

HOD/USE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

PROGRAM :-

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

class TrafficLight extends JPanel implements ActionListener{
        private JRadioButton r1;
        private JRadioButton r2;
        private JRadioButton r3;

        private Color red_c;
        private Color green_c;
        private Color orange_c;

        public TrafficLight(){
                setBounds(0,0,640,480);
                r1 = new JRadioButton("Red");
                r2 = new JRadioButton("Green");
                r3 = new JRadioButton("Orange");

                ButtonGroup group = new ButtonGroup();
                r1.setSelected(true);
                group.add(r1);
                group.add(r2);
                group.add(r3);

                add(r1);
                add(r2);
                add(r3);

                red_c = Color.red;
                green_c = getBackground();
                orange_c = getBackground();

                r1.addActionListener(this);
                r2.addActionListener(this);
                r3.addActionListener(this);
        }

        public void actionPerformed(ActionEvent e){
                if(r1.isSelected()){
                        red_c = Color.red;
                        green_c = getBackground();
                        orange_c = getBackground();
                }
                else if(r2.isSelected()){
                        green_c = Color.green;
                        red_c = getBackground();
                        orange_c = getBackground();
                }
                else if(r3.isSelected()){
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program
Date:

AIM

Write a
one of th
turned o
starts.

ALGORI

Step 1
Step 2:-
Step 3:-
Step 4:-
Step 5:-
Step 6:-
Step 7:-
Step8:-
Step9:-
Step10:
Step11:

Program No: 10
Date: 10/11/22

Java Program that simulates a Traffic Light

AIM

Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time. No light is on when the program starts.

ALGORITHM / PROCEDURE

Step 1: Start

Step 2:- import package String and awt

Step 3:- define a class TrafficLight extends Jpanel implements ActionListner

Step 4:- declare ~~parent~~ private object instance of r_1, r_2 and r_3 color red, green and orange

Step 5:- Define a constructor and call setBound function with parameter (0,0,600,750)

Step 6:- In it, define object r_1, r_2 and r_3 as instance of JRadioButton Red Green and orange parameter

Step 7:- Create instance of Button Group and group add r_1, r_2 and r_3 and add r_1 r_2 and r_3

Step 8:- set color red, green and getBackground for selected color

Step 9:- Create part component function sets parameter(Graphics g)

Step 10:- draw oval and set the co-ordinates

Step 11:- Create a class Test 3 in that define main method

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

```
                orange_c = Color.orange;
                green_c = getBackground();
                red_c = getBackground();
            }
            repaint();
        }

        public void paintComponent(Graphics g){
            super.paintComponent(g);

            g.drawOval(50,50,50,50);
            g.drawOval(50,110,50,50);
            g.drawOval(50,170,50,50);

            g.setColor(red_c);
            g.fillOval(50,50,50,50);
            g.setColor(orange_c);
            g.fillOval(50,110,50,50);
            g.setColor(green_c);
            g.fillOval(50,170,50,50);
        }
}

class Traffic{
        public static void main(String args[]){
            JFrame f1 = new JFrame();
            f1.setVisible(true);
            f1.setSize(600,480);
            f1.setLayout(null);
            TrafficLight t = new TrafficLight();
            f1.add(t);
        }
}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Step 12:- Create an object for JFrame f1 and set the visibility, size and layout as null

Step 13:- Create another object for Traffic light

Step 14 - Call f1 add(l)

Step 15:- Stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Total
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	7
Total	**50**	47

Result

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

or-3	Total
orithm y	10
e is d.	10
ram t in	10
ed cept e	10
rks	40

Result

Output obtained and verified successfully

10/4/22

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

CYCLE - 3

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

PROGRAM :-

```
import java.util.Scanner;
class LinkedList{
        private Node head;
        class Node{
                private int data;
                private Node right;
                private Node left;
                public Node(int data){
                        this.data = data;
                        this.right = right;
                        this.left = left;
                }
        }

        public void insert(int data){
                Node temp = new Node(data);
                if(head == null)
                        head = temp;
                else{
                        Node ptr =  head;
                        while(ptr.right != null)
                                ptr = ptr.right;
                        ptr.right = temp;
                        temp.left = ptr;
                }
        }

        public void delete(){
                int x= head.data;
                head = head.right;
                head.left = null;
                System.out.println("Element " +x+ " deleted.");
        }

        public void display(){
                if(head==null)
                        System.out.println("List Empty");
                else{
                        Node ptr = head;
                        while (ptr!=null){
                                System.out.print(ptr.data + " ");
                                ptr = ptr.right;
                        }
                        System.out.println();
                }
        }
}
class LinkdLst{
        public static void main(String args[]){
                LinkedList list = new LinkedList();
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 11
Date: 17/11/22

Java Program for Doubly Linked List Operations

AIM

Write a Java program for the following:

1. Create a doubly linked list of elements.
2. Delete a given element from the above list.
3. Display the contents of the list after deletion

ALGORITHM / PROCEDURE

1 Start

2. Define a class Linkedlist and declare private instance of Node head

2.1:- Define class Node declare private int data and private instance of node left and right

2.1.1:- Define constructor reading data as parameter and assign data ie, this.data and null ie this.left and this.right

2.2 : Define function insert taking data as parameter create an instance of node with data as parameter named temp.

2.2.1:- If head == null else goto 2.2.2

2.2.1.1:- assign temp to head

2.2.2:- Define Node instance ptr and assign value as head

2.2.3:- With loop enclosed using while check if ptr.right != null if true goto 2.2.3.1

2.2.3.1:- set ptr = ptr.right

2.2.4 : Set ptr.right = temp and temp.left = ptr

2.3 : Define function delete define

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

```
        Scanner sc = new Scanner(System.in);
        String ch = "";

        System.out.println("1.Insert at end\n2.delete from front\n3.Display\n4.Exit");
        while(!ch.equals("4")){
            System.out.print("\n\nEnter choice:");
            ch = sc.nextLine();
            switch(ch){
                case "1":
                    System.out.print("Enter a number: ");
                    int data = sc.nextInt();
                    sc.nextLine();
                    list.insert(data);
                    System.out.print("Inserted successfully");
                    break;
                case "2":
                    list.delete();
                    break;
                case "3":
                    list.display();
                    break;
                case "4":break;
                default: System.out.println("Invalid choice");
            }
        }
    }
}
```

OUTPUT :-

```
1. Insert at end
2. delete from front
3. Display
4. Exit
Enter choice:1
Enter a nunber: 5
Inserted successfully
Enter choice: 1
Enter a nunber: 6
Inserted successfully
Enter choice: 1
Fnter a nunber: 7
Inserted successfully
Enter choice:3
5
6
Enter choice:2
Element 5 deleted.
Enter choice:3
6
Enter choice:5
Invalid choice
Enter choice:4
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

[redacted]

4.Exit");

int x = head.data, head = head.right and head.left = null

2.4: Define function display if head == null, print empty also go to 2.4.1

2.4.1: Define Node ptr = head and with while loop if ptr != null print ptr.data set ptr = ptr.right

2.5: Define class Test4 and in main function create instance of Linked list, Scanner sc and define string choice = " "

2.6: With while loop included by condition !choice.equal(4) go to 2.6.1

2.6.1: print 1 insert at End 2. Delete from front 3. Display 4. Exit

2.6.2: read input into int choice using scanner

2.6.3: use switch to check value of choice

2.6.3.1: if choice is 1

2.6.3.1.1: Read data to be inserted

2.6.3.1.2: call insert method of list with the data as parameter and break

2.6.3.2: if choice is 2

2.6.3.2.1: call delete method of list and break

2.6.3.4: if choice is 3 call display method of list and break

2.6.3.5: if choice is 4 : break

2.6.3.6: define default case

2.6.3.6.1: print invalid choice

2.7: close class

3: stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

SCORING SHEET

No.	Performance criteria	Excellent-10	Good-8	Satisfactory-5	Poor-3	Total
1.	**Algorithm / Procedure**	The algorithm is precise, logically correct and is computable in minimum time	The algorithm is logically correct. But it is not completely precise and the computation time is not minimum.	The algorithm is logically correct. But not fully precise and takes large amount of time to compute	The algorithm is just logically correct	10
2.	**Program**	The code is well organized, easy to follow and logically correct.	The code is fairly organized.	The code is readable only by someone who knows its logic.	The code is poorly organized.	10
3.	**Output**	Accurate results have been achieved for all possible inputs and well formatted.	Accurate results have been achieved for the majority of the inputs.	Program produces accurate results but output is not properly formatted.	The program is free of errors but produces in accurate results.	10
4.	**Record**	Well kept, strong characterize, standardized and finished within time.	Well kept, attempt is somewhat standardized and finished.	Record is somewhat standardized but not well kept.	Not standardized and well kept also. Some entries are imperfect.	10
					Total Marks	40

CRITERIA		MARKS
Performance	40	40
Viva	10	6
Total	**50**	46

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

	Total
ım	10
	10
n	10
ı ɔt	10
ıs	40

Result

Output obtained and verified successfully

17/11/22

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM & OUTPUT

PROGRAM :-

```
import java.io.*;

public class StringQuickSort{
        String names[];
        int length;
        public static void main(String args[]){
                StringQuickSort obj = new StringQuickSort();
                String stringList[] =
{"Raja","Gouthu","Ram","Goutham","Honey","Heyaanch","Hello"};
                obj.sort(stringList);

                for(String i : stringList){
                        System.out.print(i);
                        System.out.print(" ");
                }
                System.out.println("");
        }

        public void sort(String array[]){
                if(array == null || array.length == 0)
                        return;
                this.names = array;
                this.length = array.length;
                quicksort(0,length-1);
        }

        public void quicksort(int lower, int higher){
                int i = lower;
                int j = higher;
                String pivot = this.names[lower + (higher-lower)/2];
                while(i<=j){
                        while(this.names[i].compareToIgnoreCase(pivot) < 0)
                                i++;
                        while(this.names[j].compareToIgnoreCase(pivot)>0)
                                j--;
                        if(i<=j){
                                exchangeNames(i,j);
                                i++;
                                j--;
                        }
                        if(lower<j)
                                quicksort(lower,j);
                        if(i<higher)
                                quicksort(i,higher);
                }
        }

        public void exchangeNames(int i, int j){
                String temp = this.names[i];
                this.names[i] = this.names[j];
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Program No: 12
Date: 30/11/22

Java Program That Implements Quick Sort Algorithm

AIM

Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order.

ALGORITHM / PROCEDURE

Step 1 :- start

step 2 :- Define a class Quicksort on string and declare string name[] and int length

step 2.1 :- Define main function and initiate instance of Quicksort Onstring obj create string stringlist with list of string to sort

Step 2.2 :- call sort method of obj with string list as parameter

Step 2.3 : With for loop initiated by string i loop through elements in stringList.

2.3.1 :- print element i

Step 2.4 :- define function sort reading a string array as parameter.

2.4.1 : if array == null as array length = 0 -> return

2.4.2 set this name as array this length as array length call function quicksort with 0 and length - 1 as parameter

Step 2.5 Define function quicksort with lowerindex and higherindex as parameter

2.5.1 - int i as lower index, int j as higherindex and string pivot as name[lowerindex + (higherindex - lowerindex)/2]

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

```
                this.names[j] = temp;
            }
}
```

OUTPUT :-

Goutham Gouthu Hello Heyaanch Honey Raja Ram

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

2.5.2: with while loop initiated by i<j

2.5.2.1 with while loop initiated by this. name[i]. compTolgnare case(pivot) < 0

2.5.2.1.1: increment i by 1

2.5.2.2: with while loop initiated by this name[j]. comptolgore case(pivot) > 0.

2.5.2.3 decrement j by 1

2.5.2.3 If i <= j ; call exchange name(i, j); i++, j--

2.5.2.4: If lowerinder < y => quicksort(lowerinder, j)

2.5.2.5 If i < higherinder => quicksort(i, higherinder)

2.6: Define function ExchangeName Taking int i and int j as parameters

2.6.1 declare string temp and assign this name [i]

2.6.2: assign this name[i] as this. name[j]

2.6.3 assign this name[j] as temp

2.7: close class Quicksort on string

3:- Stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD/CSE

VIVA QUESTIONS

1. What is OOPS?
2. What are the main features of OOPs?
3. What are packages?
4. List out any three built in packages.
5. What are data types?
6. List out different types of operators.
7. Syntax for conditional operators.
8. Define control statements.
9. Difference between do-while and while loop statements
10. 10.Flowchart - Nested if else statements.
11. List out the Java Buzzwords.
12. Write basic concepts of OOPs13.What is a class?
14. Differentiate Super class and Sub class.
15. What is an Object?
16. What is encapsulation?
17. What is abstract class?
18. Difference between abstract class and interface.
19. What is inheritance?
20. What is multi-level inheritance?
21. What is a file?
22. List out the file operations in Java.
23. Differentiate byte stream and character stream.
24. What are object stream.
25. What is a String?
26. Difference between Strings & String Buffer.
27. List some File handling functions.
28. What is String Tokenzier?

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

29. What are tokens?
30. What are exceptions?
31. What is an error?
32. Types of exceptions in Java
33. What is Exception Handling?
34. Difference between throws and throw keywords.
35. Use of finally keywords.
36. Explain threads in java.
37. What is the process called thread synchronization.
38. Use of synchronized keyword in threads.
39. Life cycle of threads.
40. Example for occurrence of exceptions.
41. What is an Event?
42. Explain Delegation Event Model.
43. How events are handled in Java?
44. List out some source events and its corresponding listeners.
45. Explain the term Listener.
46. What is Swing in Java
47. List out some swing packages.
48. 48.What is an Applet
49. Difference between AWT & Swing.
50. What is JDBC? Explain 5 steps in connecting JDBC.
51. What is a linked list?
52. Briefly explain quick sort?
53. Difference between linked list and doubly linked list.
54. Difference between packages and interface.
55. How multiple inheritance implemented using interface.
56. Differentiate stack, queue, linked list.
57. What is an array?

HOD/CSE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Completed & Certified

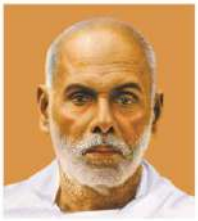
3/12/22

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

Est. 2003

Sree Narayana Guru College of Engineering & Technology

CHALAKKODE P.O., KOROM, PAYYANUR, KANNUR-670 307



DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

SREE NARAYANA GURU
COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR – 670 307

CERTIFICATE

Name: JISHNU GIRISH
Semester: S4 Branch: ECE
Roll No: 2 Uni. Reg. No: SNG21EC002

Certified that this is a Bonafide Record of the work done in the ECL 202 ANALOG CIRCUITS AND SIMULATION LAB *of Sree Narayana Guru College of Engineering & Technology, Payyanur by* JISHNU GIRISH.

10/07/23
Staff Member Incharge
Assistant Professor
Department of ECE
SNGCET, Payyanur

Place : PAYYANUR

Date : 10/07/23

HoD, ECE

17/8/23
Internal Examiner

17/8/23
External Examiner

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

INDEX

Sr. No.	Name of the Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
1.	RC INTEGRATOR AND DIFFERENTIATOR	1-9	29/3/23		9/4/23
2.	CLIPPING AND CLAMPING CIRCUIT	10-18	12/4/23		15/5/23
3.	RC COUPLED AMPLIFIER	19-24	17/6/23		21/06/23
4.	RC PHASE SHIFT OSCILLATOR	25-27	16/6/23		21/06/23
5.	CASCADE AMPLIFIER	28-30	16/6/23		21/06/23
6.	SERIES VOLTAGE REGULATOR (LINE AND LOAD)	31-33	21/6/23		10/7/23
	PART B : SIMULATION EXPERIMENTS	34	21/6/23		
	FAMILIARIZATION OF PSPICE SIMULATION SOFTWARE	35-39	21/6/23		10/7/20
1.	RC DIFFERENTIATOR AND INTEGRATING CIRCUITS	40-42	21/6/23		10/7/20
2.	CLIPPING CIRCUITS	43-44			
	CLAMPING CIRCUITS	45-46	21/6/23		10/7/20
3	RC COUPLED AMPLIFIER	47-48	24/6/23		
4	RC PHASE SHIFT OSCILLATOR	49-50	24/6/23		10/7/23
5	CASCADE AMPLIFIER	51-52	24/6/23		
6	SERIER VOLTAGE REGULATOR	53-56	24/6/23		10/7/23.

Completed all experiments

Verify by

Thrushna

Dr. LEENA A. V.
PRINCIPAL
NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY, PAYYANNUR

Assistant Professor
Department of ECE
SNGCET, Payyannur

Experiment Name / No.: 1

Camlin Page No. 1
Date 29/ 3 / 2023

RC INTEGRATOR AND DIFFERENTIATOR

AIM:

1. To design and set up a RC integrator circuit. RC differentiator circuit and study the response to square wave.
2. To observe the response of the designed circuit for the given square waveform for $RC << T$, $RC = T$, $RC >> T$.

COMPONENTS AND EQUIPMENTS REQUIRED:-

Resistor 5.6 kΩ	-	1No
Capacitor 0.2 μF, 0.1 μF, 0.22 μF, 1 μF	-	1No
Function generator	-	1No
CRO	-	1No
Bread Board	-	1No
connecting wires	-	1 No.

THEORY:

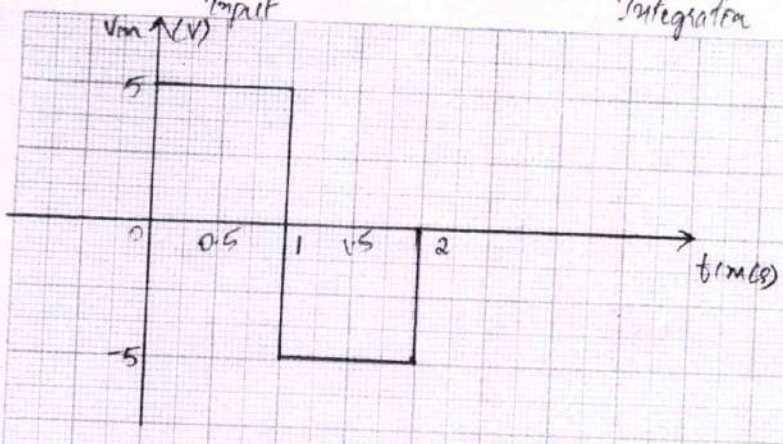
An RC integrator is constituted by a resistance in series and a capacitor parallel with the output. This circuit produce an output voltage that is proportional to the integral of the input. There the time constant is very large in comparison with the time required for the input signal to change. Under this condition the voltage drop across C will be very small in comparison with the drop across R. The current is V_{in}/R almost all current appear across R.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:

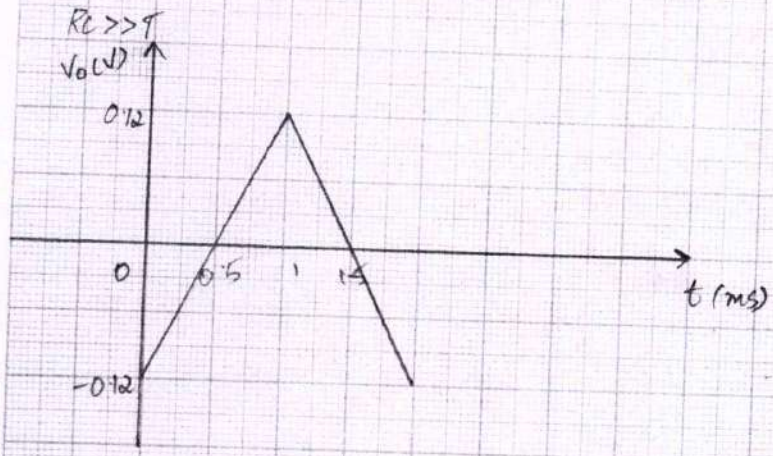
Input

Integrator



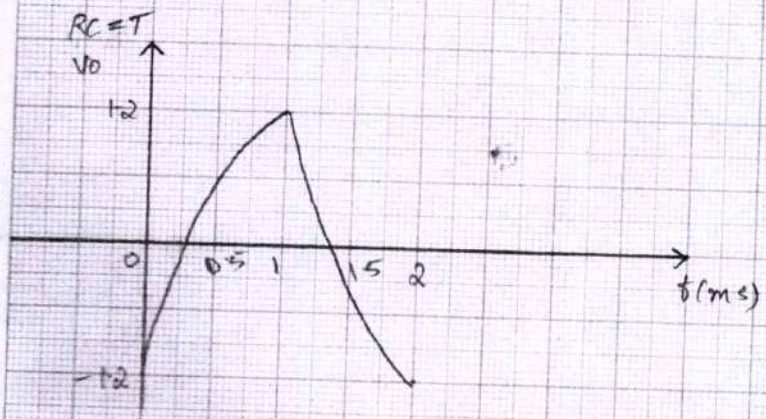
Scale

on x-axis 1cm = 0.5 ms
on y-axis 1cm = 0.5 V



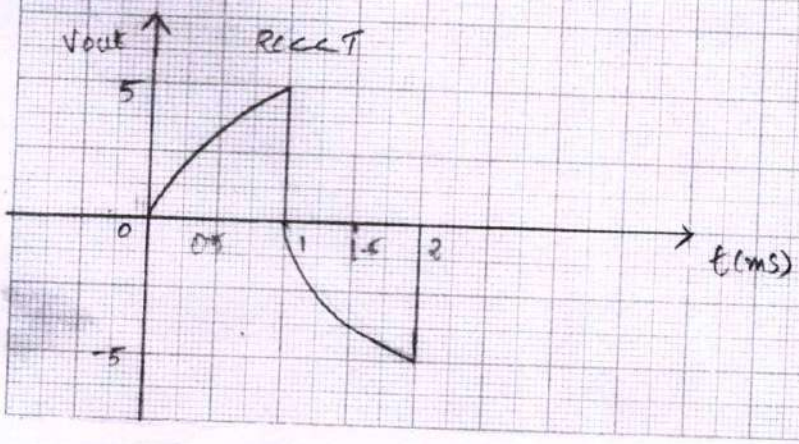
Scale

on x axis 1cm = 0.5 units
on y axis 1cm = 0.6 units



Scale

on x-axis 1cm = 0.5 units
on y axis 1cm = 0.6 units

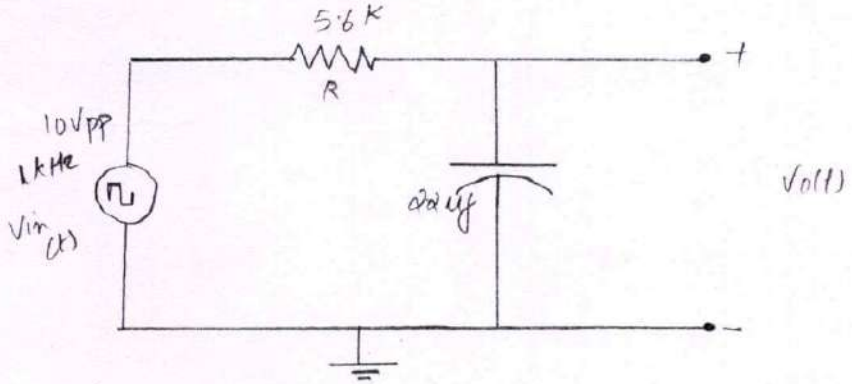


Scale

on x-axis 1cm = 0.5 units
on y-axis 1cm = 2.5 units

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

CIRCUIT DIAGRAM



Rc Integrator

Design

Case 1: $RC \gg T$

To avoid loading, select R = 10 times the o/p impedance of signal generation. If o/p impedance = 600 Ω, select R = 6000 Ω we R = 5.6 kΩ

$RC = 10T$ where $R = 5.6\,k\Omega$ and $T = 1ms$

Then $C = 10T/R = 1.78\,\mu F$ (2.2 uf std)

Case 2: $RC = T$

$RC = T$, where $R = 5.6\,k\Omega$ and $T = 1ms$

Then $C = T/R = 0.22\,\mu F$ (0.22 uf std)

Case 3: $RC \ll T$

$RC = 0.1T$

where $R = 5.6\,k\Omega$, $T = 1ms$

Then $C = 0.1\,T/R$

$= 0.0178\,\mu F$ (0.01 uf std)

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

output voltage across CD for $RC >> T$,

Voltage drop across C increases as time increase a square waveform has positive and negative excursions with respect to its reference zero. If the input is square wave, capacitor charges and discharge from negative voltage to the positive voltage and back. for the input to work as a good integrator $\theta = 90°$. As $\tan\theta = \omega RC$; $\tan 90 = \text{infinity}$ which is practically impossible. Therefore a reasonable criterion for good integration is $\theta = 89.4°$ if $\theta = 89.4°$, $\omega RC = 95.48°$, so $RC > 167$ will give the integrating practically.

An RC differentiator circuit is constituted with a capacitor connected in series and a resistor connected in parallel to the output. The time constant RC of the circuit is very small in comparison with the time period of all the input signal. The voltage drop across R will be very small in comparison with the drop across C. The current through capacitor is C. Hence the output is proportional to the derivative of the input output voltage across R is

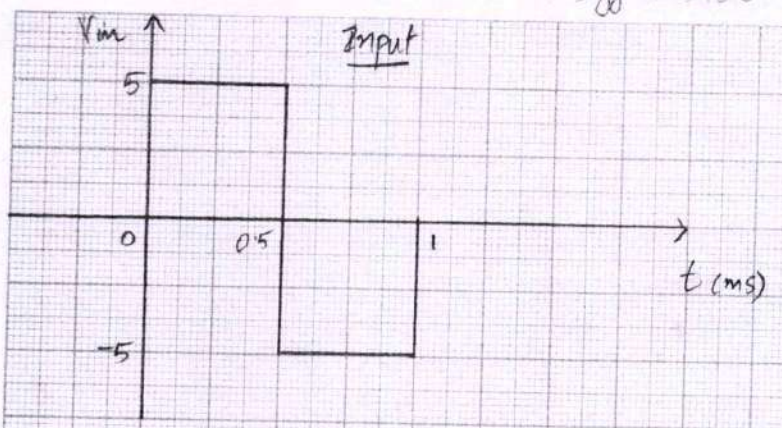
For $RC << T_0$

Differentiated output is proportional to the rate of change of input. when the input rises to maximum value, differentiator o/p follows it because the rate of change of voltages is transferred to the output capacitor. by the rate of change of voltage is positive differentiated output also positive. when input remains maximum for a period of time. The rate of change of voltage is zero. So input falls to zero.

Differentiator

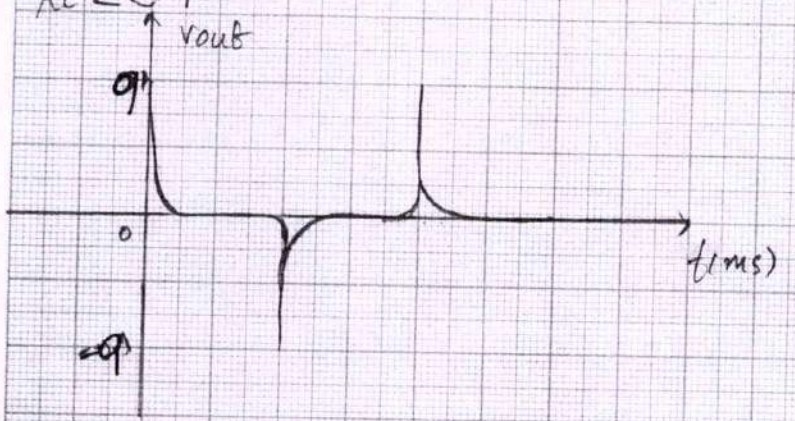
Scale

On X axis 10 DIV = 0.25 ms
On Y axis 10 DIV = 25 V



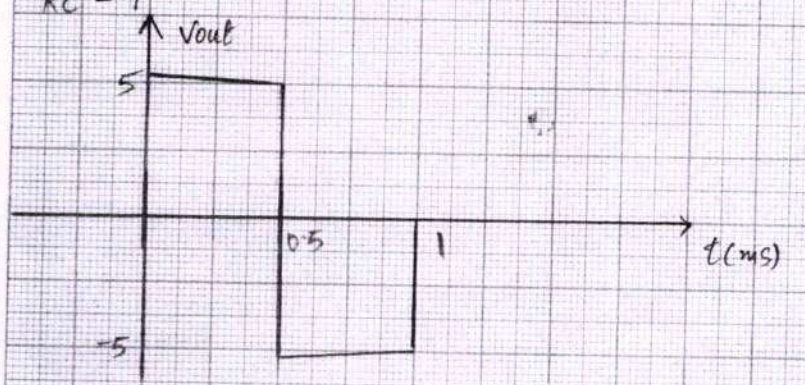
RC << T

On X axis 10 DIV = 0.25 (ms)
On Y axis 10 DIV = 2.5 V

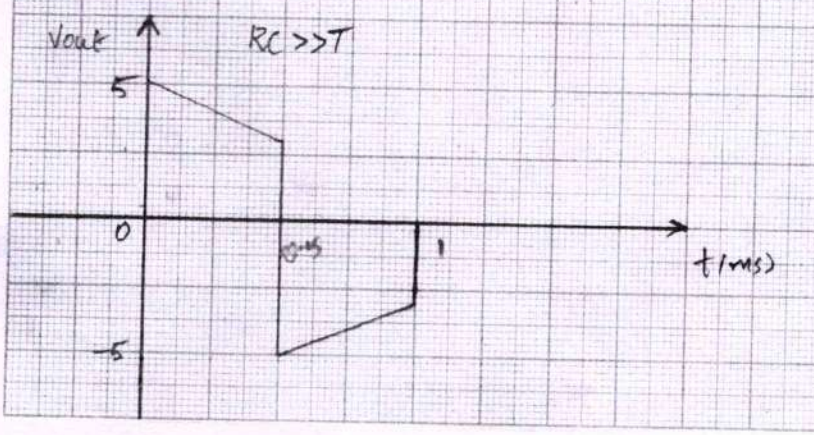


RC = T

On x axis 10 DIV = 0.25 ms
On y axis 10 DIV = 2.5 V



On x axis 10 DIV = 0.25 ms
On y axis 10 div = 2.5 V



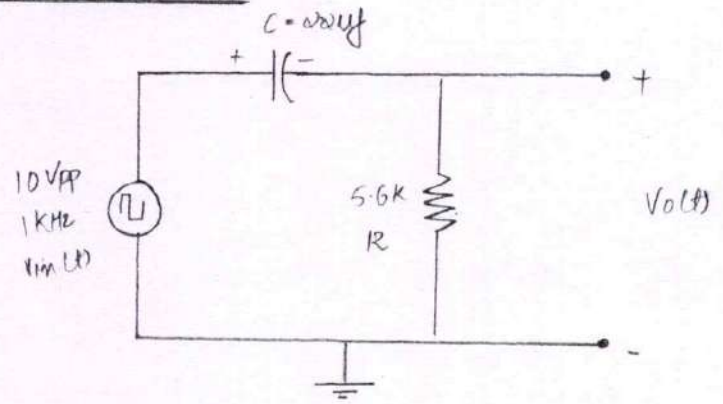
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

During this time input act like a dc voltage and capacitor offers high impedence to it. So the change in capacitor drains like dc voltage and capacitor offers high impedence to it. So the changes in capacitor drains like a dc voltages and capacitor offer high impedence to it. So the changes in capacitor drains to earth through the resistance. when i/p falls to zero. rate of change of input voltage is negative. Then the output also goes to negative.

For the circuit to work as a good ~~to~~ negative differentiator $\theta = 90°$, As $\tan\theta = 1/\omega RC$, $\tan 90 =$ infinite. This result can be obtained only $\omega CR = 0$ or $C = 0$, which is practically impossible. Therefore a reasonable criterion for good differentiator is $\theta = 89.4°$ if $f = 100$ so $RC = 0.0016T$ will give the differentiating practically. Assume $RC = \cancel{00}$ $0.0016T$ will give good spikes waveform. The peak of the output of the differentiator gets doubled when the square wave is fed to the input.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RC DIFFERENTIATOR



Case 1: $RC << T$

To avoid loading, select $R = 10$ times the output impedance of signal generator. If o/p impedance $= 600\Omega$, select $R = 6000\Omega$ use $R = 5.6\,k\Omega$

$RC = 0.01T$, where $R = 5.6\,K\Omega$ and $T = 1ms$

then $C = 0.01\,T/R = 1.78\,nF$ (2.2 nf std)

Case 2: $RC = T$

$RC = T$, where $R = 5.6\,k\Omega$ and $T = 1ms$

then $C = T/R = 0.22\,\mu F$ (0.22 μF std)

Case 3: $RC >> T$

$RC = 5T$

where $R = 5.6\,k\Omega$ and $T = 1ms$

then $C = 5\,T/R = 0.89\,\mu F$ (1 μF std)

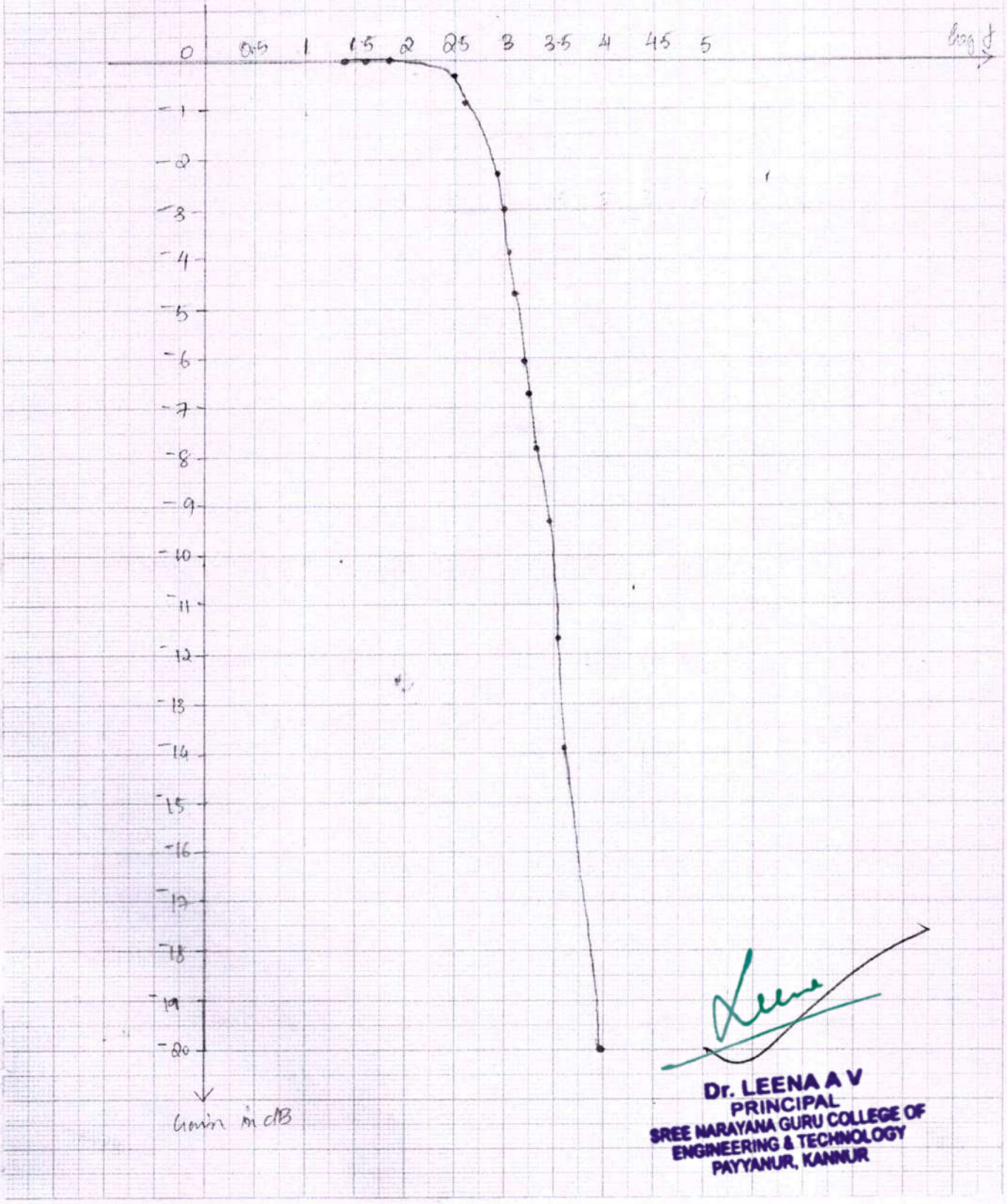
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Integration

Scale

On x axis 10 DIV = 0.5

On y axis 10 DIV = 1



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

OBSERVATION (DIFF)

F	Vo	log F	Gain = 20 log $\frac{V_o}{V_{in}}$
50 Hz	02	1.69	-33.9
100	04	2	-27.95
150	1.2	2.17	-18.41
200	1.15	2.3	-18.79
250	2	2.39	-13.97
300	2.35	2.47	-12.57
350	2.8	2.54	-11.05
400	3	2.60	-11.05
450	3.8	2.60	-10.45
500	4.4	2.69	-8.40
600	4.9	2.77	-7.15
700	6.2	2.84	-6.19
1 kHz	6.2	3	-4.15
2 kHz	8.4	3.30	-1.51
3 kHz	9	3	-0.91
4 kHz	9.4	3.60	-0.53
6 kHz	9.6	3.77	-0.35
8 kHz	10	3.90	0
10 kHz	10	4	0
12 kHz	10	4.07	0

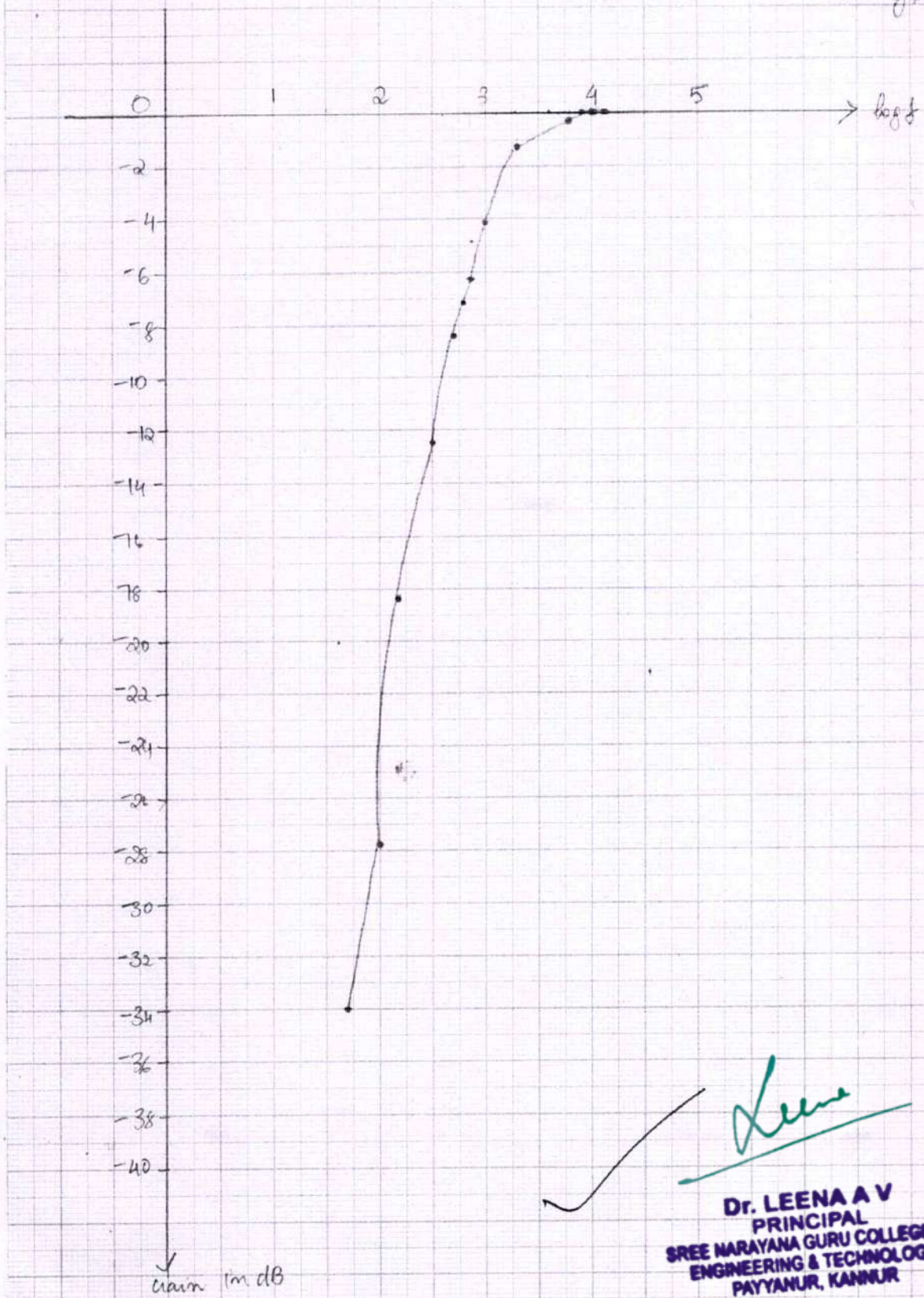
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Differentiator

Scale

on x axis 1cm = 0.5

on y axis 1cm = 2



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROCEDURE :

1. Set up the circuit as per the diagram of integrator
2. Switch on the function generator and set a square wave of 2Vpp, KHz
3. Observe the input and output on the x and y channels of CRO respectively
4. Note down the o/p waveform for the following construction
   - RC << T
   - RC > T
   - RC >> T (integrator)
5. Repeat the same step for differentiator

RESULT:

RC integrator and differentiator circuits are designed and observed the waveform for different time constants.

Procedure (5)	5
Conduction (5)	5
Result (5)	4
Viva (10)	8
Record (5)	4

19/4/23

HOD ECE

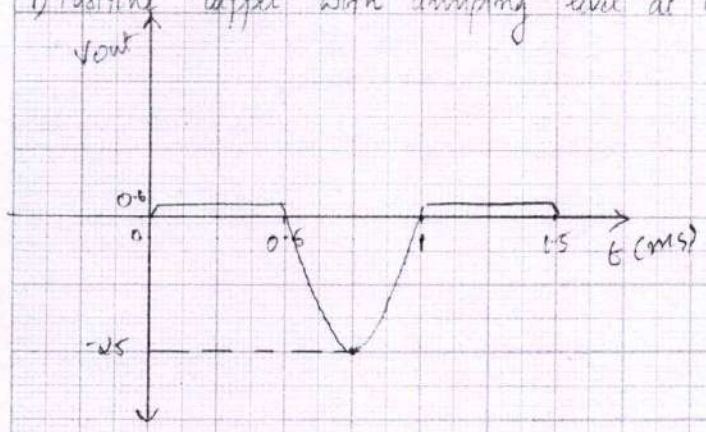
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

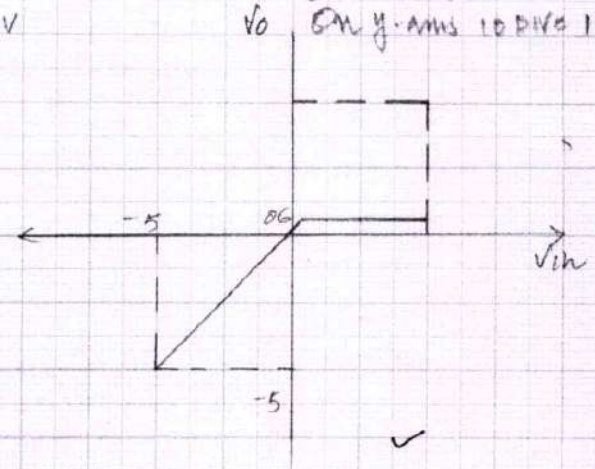
Scale

On x-axis 100V = 0.25 ms

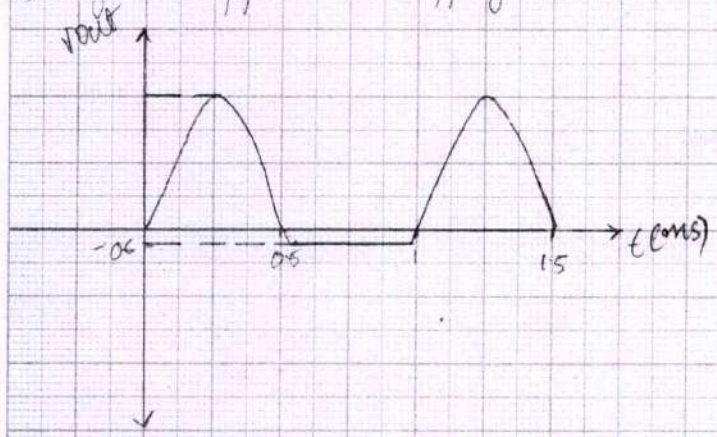
On y-axis 10 DIV = 1(V)

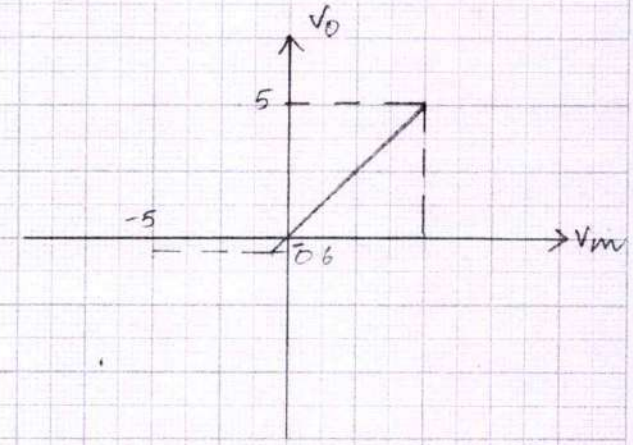
1) Positive clipper with clamping level at 0.6V



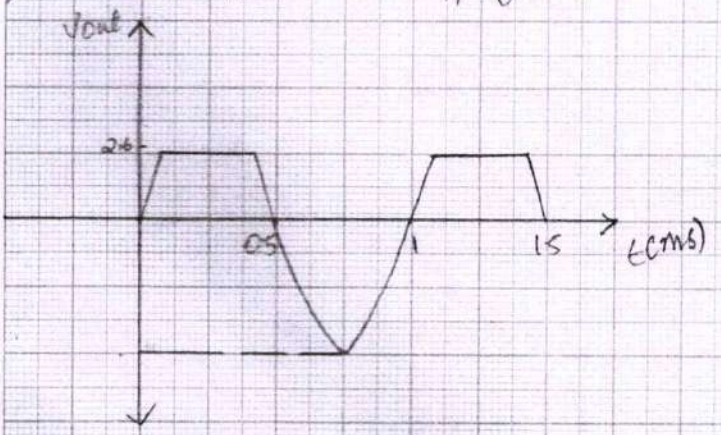


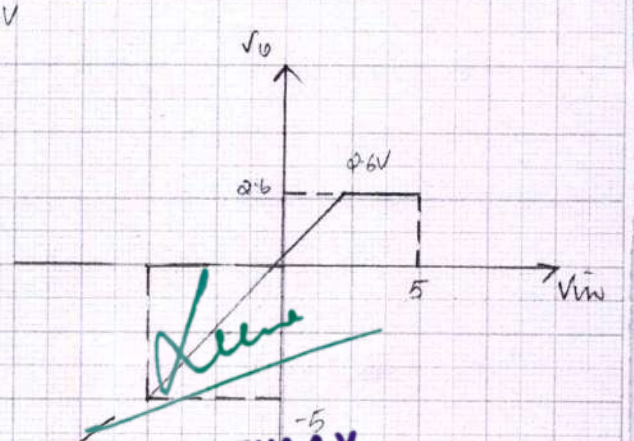
2) Negative clipper with clipping level at 0.6V





3) Positive clipper with clipping level at +2.6V





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

CLIPPING AND CLAMPING CIRCUITS

AIM:

Design and set up various clipping circuits and clamping circuits using diodes and plot the output waveform and transfer characteristics

Components and equipments required :-

PN Diode 1N4007	-	1 No
Zener Diode 5250	-	1 No
Resistor 33 kΩ	-	1 No
Function Generator	-	1 No
CRO	-	1 No
Regulator power supply	-	1 No

Bread Board

Capacitor 1 μf

Connecting wires

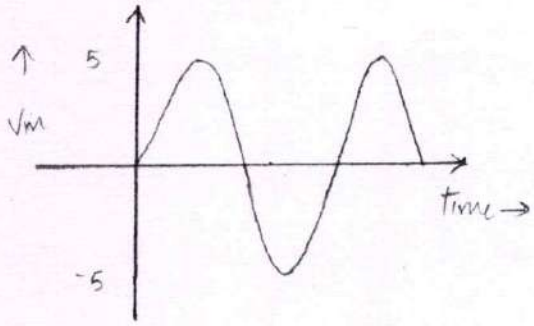
Theory :

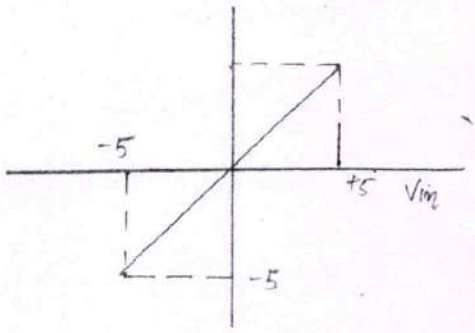
Clipping circuits :

The property of a diode as a switching device is utilized in clipping circuits. Clipping circuits are linear wave shapping circuits. They are fully to clip of the +ve or -ve portions of an input signal waveform. It can also be used to slice off an input waveform between two voltage levels. Using a positive clipper modulate quality square waveform can be generated wave. The diode clipper can be classified as series and shunt clipper. If the diode is connected in series with input in a

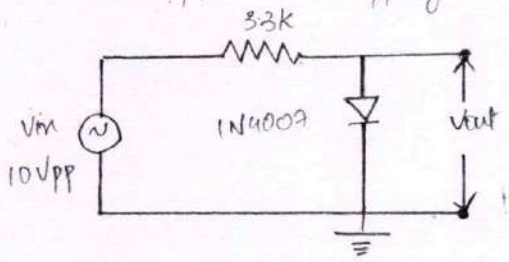
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

CIRCUIT DIAGRAM

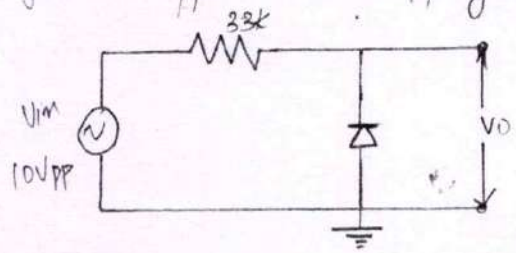




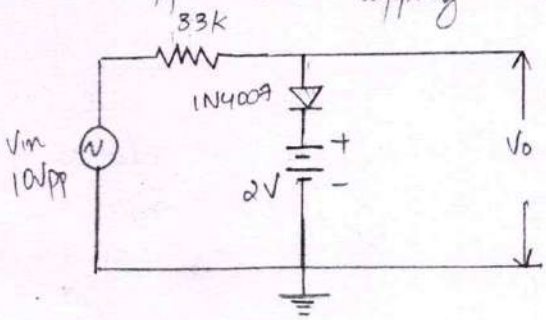
1. Positive clipper with clipping level at 0.6V



2. Negative clipper with clipping level at 0.6V



3. Positive clipper with clipping level at +2.6V



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

clipper, such a clipper is called a series clipper. If it connected in parallel its called shunt clipper. A resistor is used to limit the current through the diode where R1 = forward resistance of the diode and R1 is reverse resistance of the diode.

1. Positive clipper at clipping level at 0.6V:

This clipper circuit passes only negative given half cycle of the input to the output. The entire positive half cycle is bypassed through the diode since the diode the clipping occurs exactly at 0.6 V.

2. Negative clipper with clipping level at 0.6V:

This circuit passes only positive going half cycle of the input to the output the entire negative half cycle is bypassed through the diode since the diode gets forward biased when the input become negative. Due to the voltage drop across the diode the diode the clipping occurs exactly at 0.6V.

3. Positive clipper with clipping level at +2.6 V

For the diode to be forward biased anode voltage must be greater than cathode voltage. Till the input become greater than +2V, diode is reverse biased and the input will at the output. When the input exceeds +2V, diode become forward biased and the cell voltage appear at the output. Since the diode is in series with the cell, actual clipping level is +2.6V.

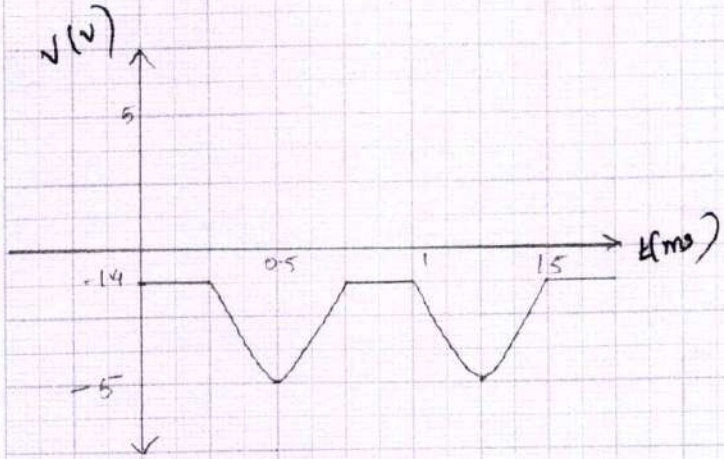
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

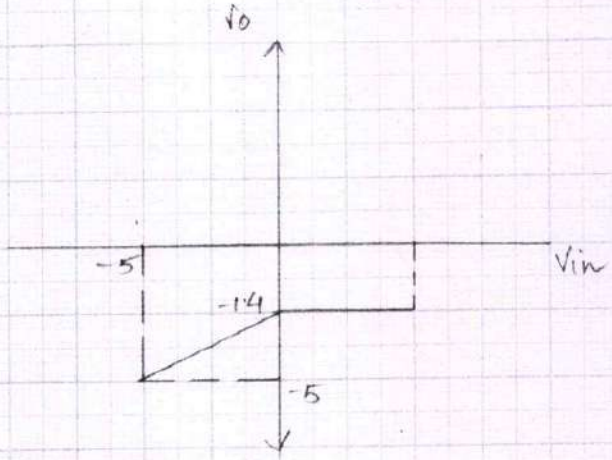
Scale

on x-axis 10 DIV = 0.25 ms

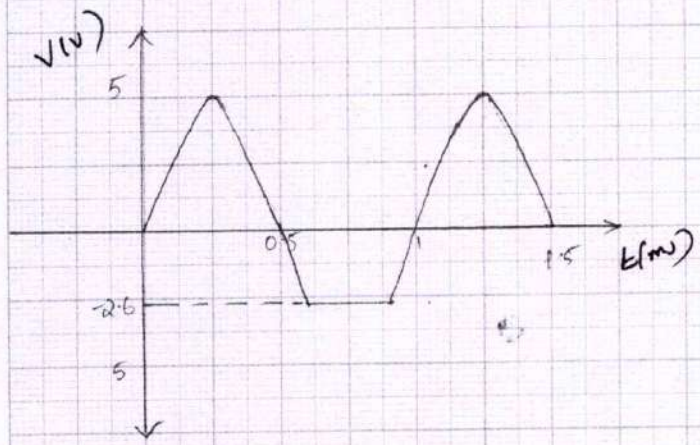
on y-axis 10 DIV = 0.5 V

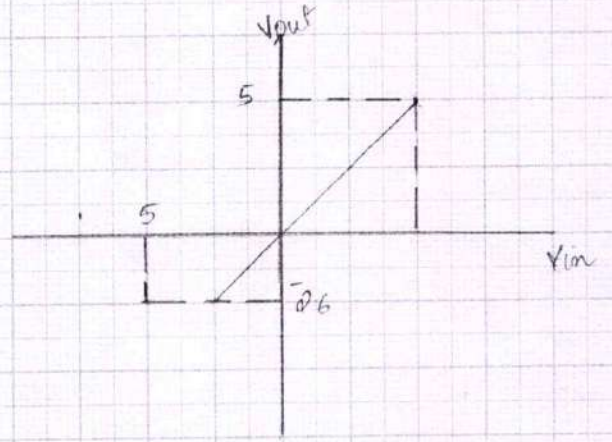
4) Positive clipper with clipping level at −1.4 V



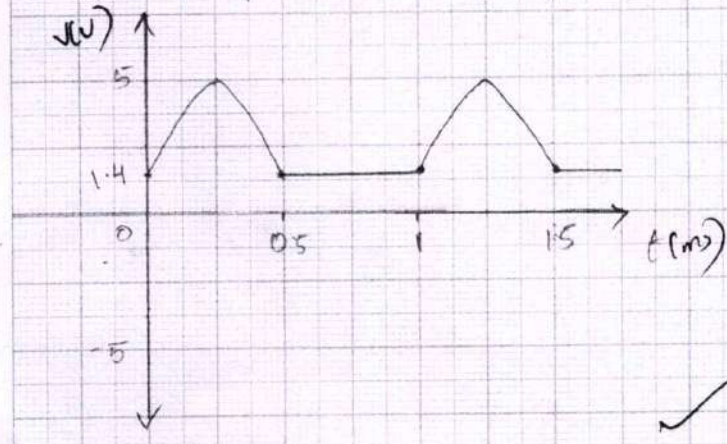


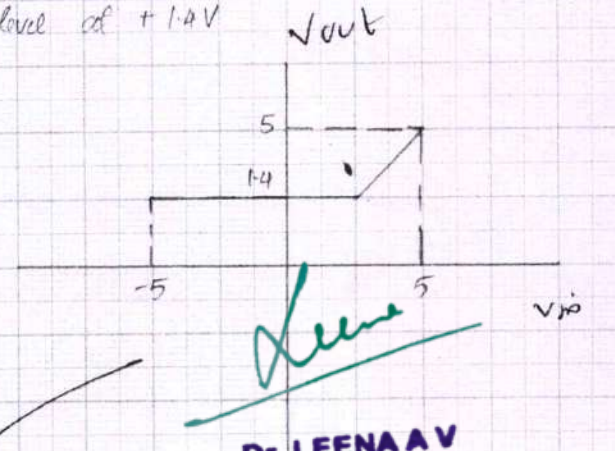
5) Negative clipper with clipping level at −2.6 V





6) Negative clipper with clipping clipping level of +1.4 V





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

4. Negative clipper with clipping level at -2.6V

Till the input becomes less than -2V, diode is reverse biased and the input will appear at the output. When the input is less than -2V, diode becomes forward biased and the cell voltage appear at the output. Since the diode is in series with the cell, actual clipping level is -2.6V.

5. Positive clipper with clipping level at -1.4V:

The diode is forward biased till the input becomes less than -1.4V. Here the cell voltage appear at the output. During the negative cycle when the input is less than -1.4V, diode is reverse biased and input appear at the output.

6. Negative clipper with clipping level at +1.4V

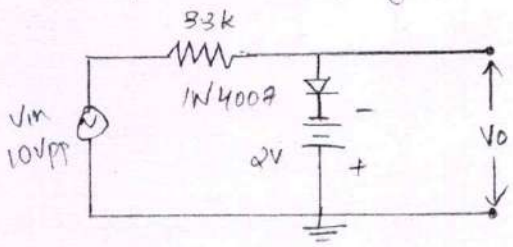
During the positive cycle when the input is greater than +1.4V, diode is reverse biased and input appear at the output. Till the input becomes greater than +1.4V diode is forward biased and the cell voltage appears at the output.

7. Double clipper with clipping level at +3.6V & -2.6V

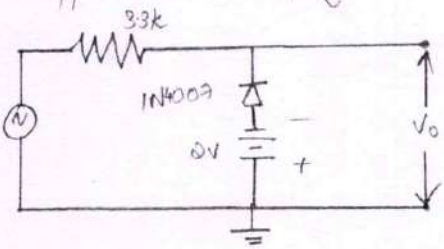
The circuit is the merging positive and negative clipper. During the positive half cycle of the input, one branch will be effectively and the other open and vice versa during negative half. Actual clipping level also +3.6V and -2.6V

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

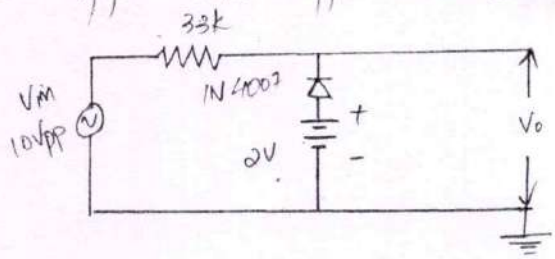
4) Positive clipper with clipping level at -1.4V



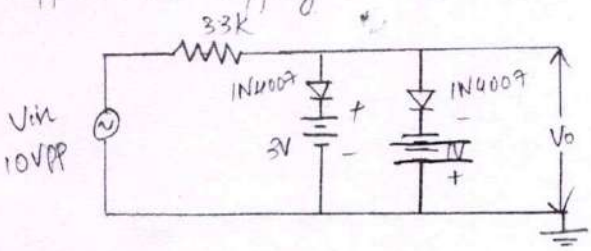
5) Negative clipper with clipping level at -2.6V



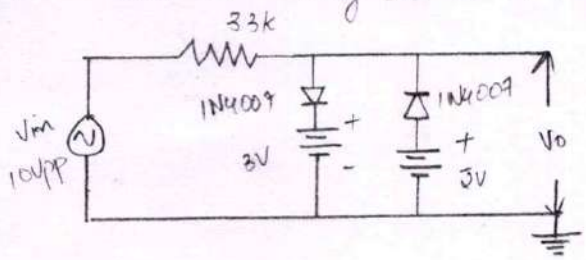
6) Negative clipper with clipper level at 1.4V



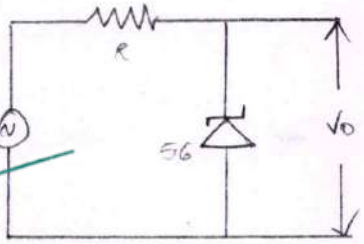
7) Double clipper with clipping level at +3.6V & -2.6V



8) Positive slicer with slicing level at 1.4 & 3.6V



9) clipper Using Zener diode



8 Positive Slicer with slicing level at +1.4V & +3.6V

This circuit allows the signal to pass to the output only between +3V and +2V. During the negative half cycle of the input, diode D1 conducts and diode D2 gets reverse biased. Thus the output remains at +2V. During the positive half cycle of the input, when input exceeds +2V, D1 is reverse biased and D2 conducts and the output remains at +3V. Actual clipping levels at +1.4V and +3.6V

9. Clipper Using Zener Diode:

During positive cycle till +5.6V Zener diode is reverse biased and all of input will appear at output. The output remains at +5.6V. During negative cycle diode is forward biased and the diode drop of -0.6V will appear at the output.

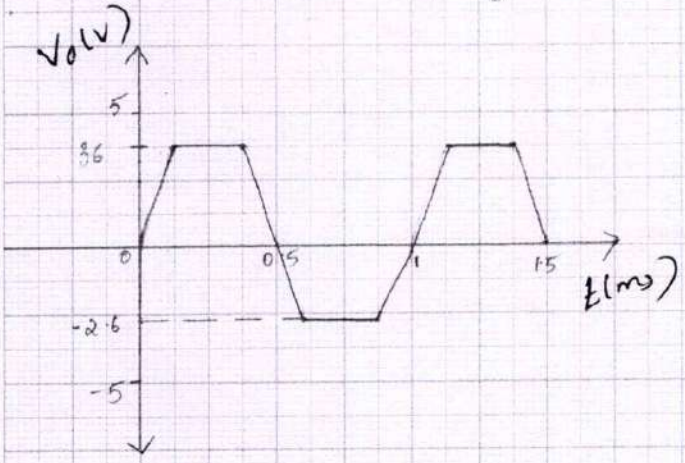
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

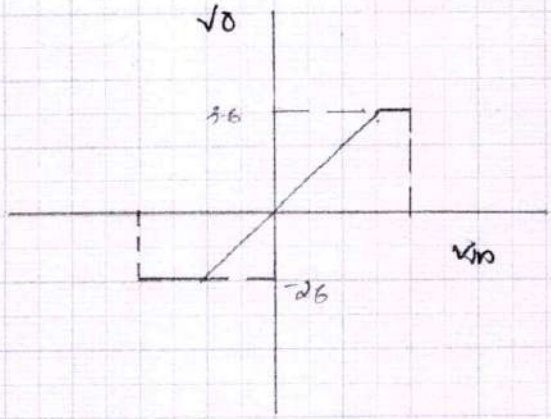
Scale

on x axis 10 DIV = 0.25 (ms)

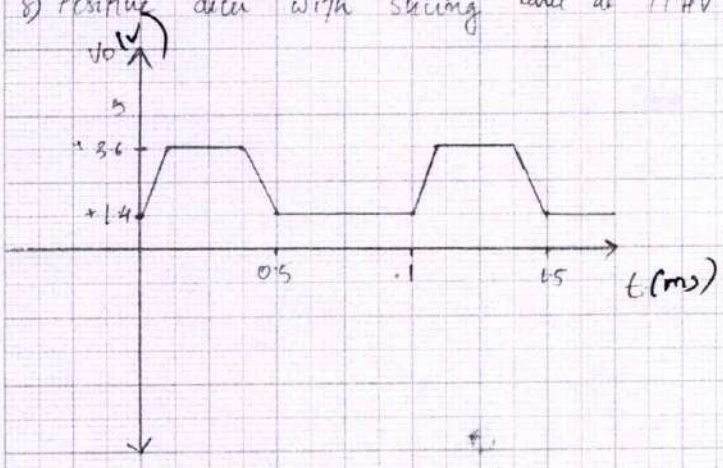
on y axis 10 DIV = 0.5 (V)

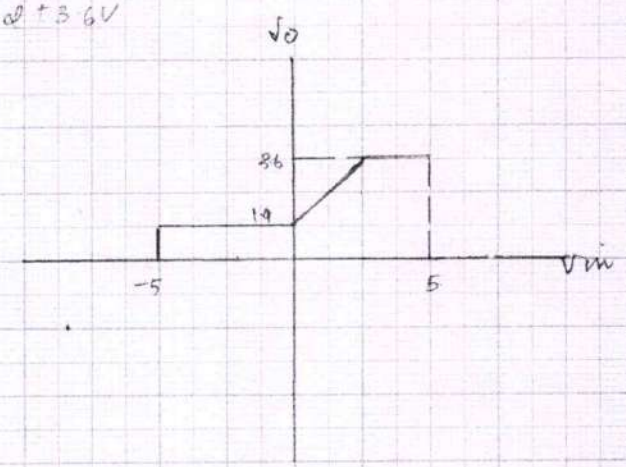
7) Double clipper with clipping level at +3.6V & -2.6V



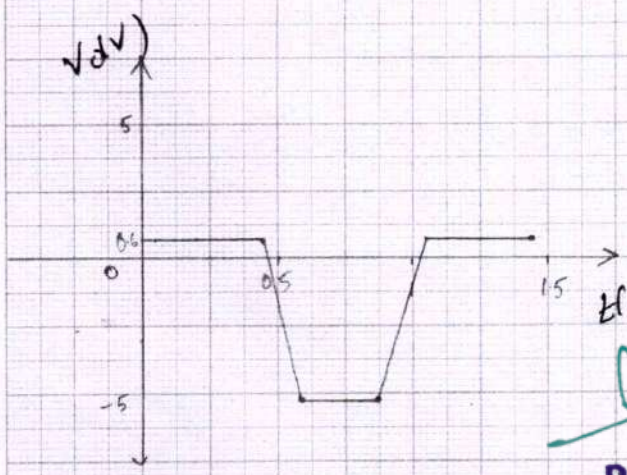


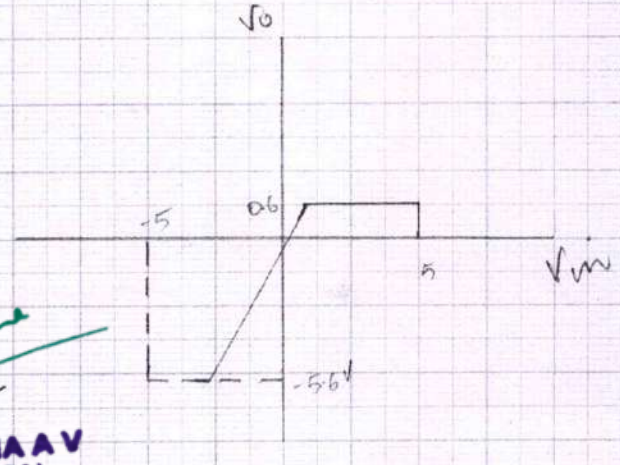
8) Positive clipper with shifting level at +1.4V & +3.6V





9) clipper using Zener diode





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

CLAMPING CIRCUITS :

Clamping circuits are necessary to add or substract a dc voltage to a given waveform without changing the shape of the wave form. A capacitor which is charged to a voltage and subsequently prevented from discharging serve as a suitable replacement. This is the principle of clamping circuit. The clamping level can be made upto any level by adjusting the biasing of the diode. Such biasing circuits are called clamping circuits.

1. Positive clamper with clamping level at 0V:

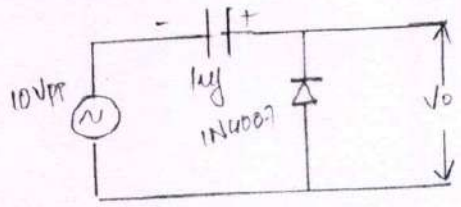
During one negative half cycle of the input sine wave, the diode conducts and capacitor charges to V_m with positive polarity at right side of the capacitor. During the positive cycle of the input sine wave, the capacitor cannot discharge since the diode not conduct. The capacitor act as a dc source. The output voltage can be then replaced as $V_o = V_{in} + V_m$ sin wt.

2. Negative clamper with clamping level at 0V:

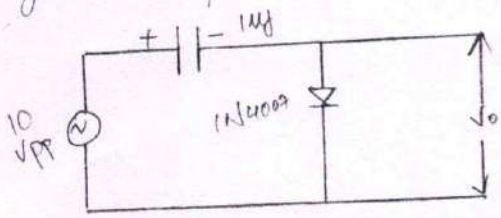
During one positive half cycle of the input sine wave the diode conducts and capacitor charges to V_m with negative polarity at right side of the capacitor. During negative half cycle of the input sine wave, the capacitor cannot discharge since the diod does not conduct. Then capacitor act as a dc source of V_m connected in series with the input signal source. Output voltage then can be expressed as $V_o = V_{in} - V_m$ sin wt.

CIRCUIT DIAGRAM

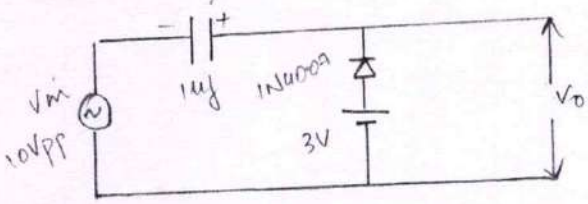
1) Positive clamper with clamping level at 0V



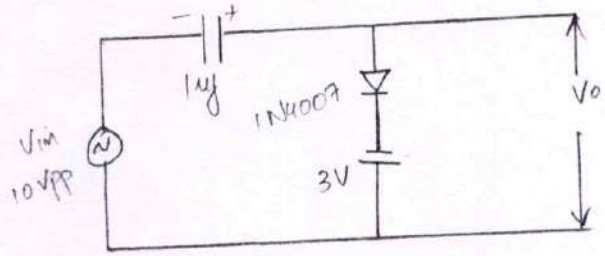
2) Negative clamper with clamping level at 0V



3) Positive clamper level at +3V



4) Negative clamping with clamping level at -3V



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

3. Positive clamper with clamping level at +3V

During one negative half cycle of the input sine wave, capacitor charge through the dc source and diode till (Vm+3) volts with positive polarity of the capacitor at the right side. The charging of the capacitor is limited to (Vm+3) volts due to the pressure of the dc source. The output is then $V_o = (V_m+3) + V_m \sin \omega t$.

4. Negative clamper with clamping level at -3V:

During one positive half cycle of the input sine wave, capacitor charges through the dc source and diode till (Vm+3) volts with the negative polarity of the capacitor at the right side. The charging of the capacitor is limited to (Vm+3) volts due to the pressure of dc source. The output $V_o = -(V_m+3) + V_m \sin \omega t$.

5. Positive clamper with clamping level at -3V:

During one negative half cycle of the input sine wave, capacitor charges through the dc source and diode till (Vm-3) volts with positive polarity of the capacitor at the right side. The charging of the capacitor is limited to (Vm-3) volts due to the pressure of the dc source. The output is then $V_o = (V_m-3) + V_m \sin \omega t$.

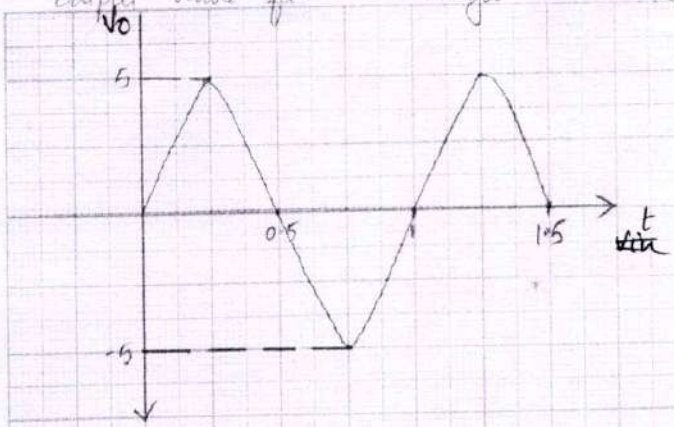
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

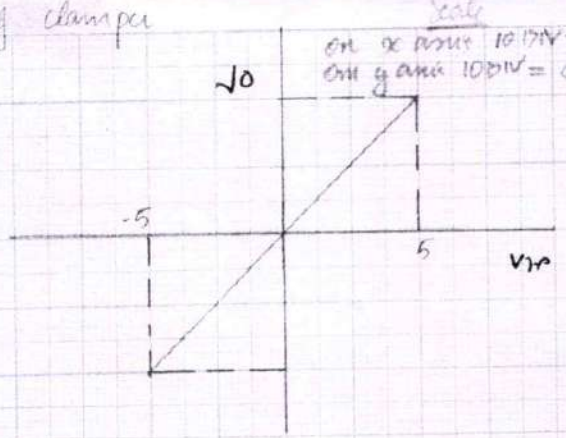
6. Negative clamper with clamping level at +3V:

During one positive cycle of the input sine wave capacitor through the dc source and diode till (Vm-3) volts with negative polarity of the capacitor at the

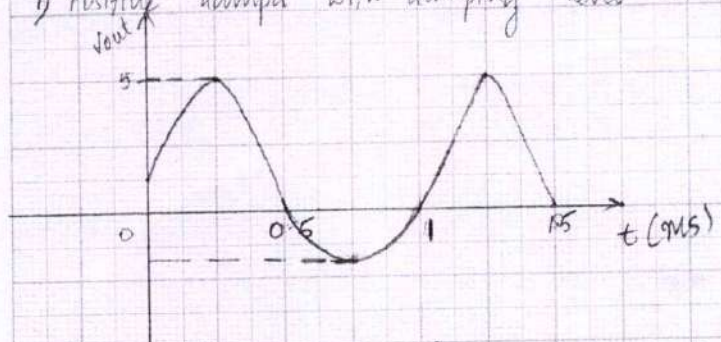
Output Wave form & Transfer characteristics of clamper

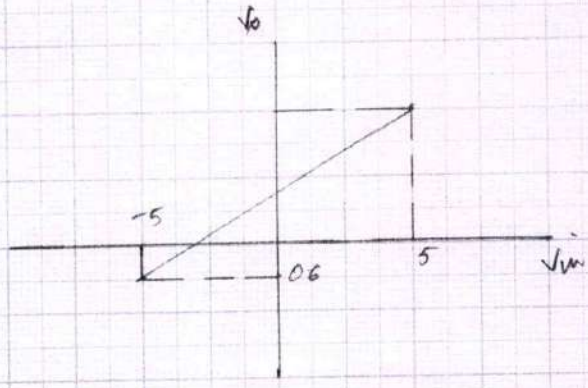
Scale
On x axis 10 DIV = 0.25
On y axis 10 DIV = 0.5



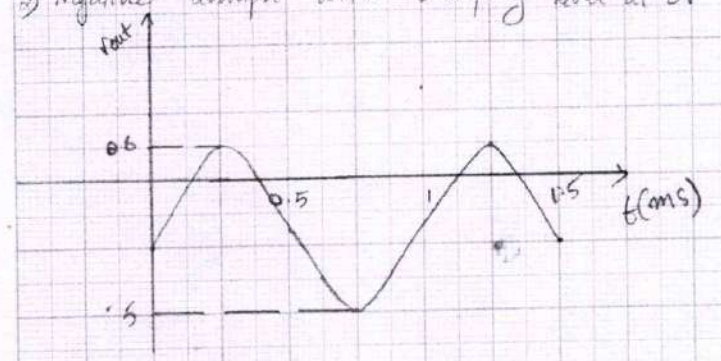


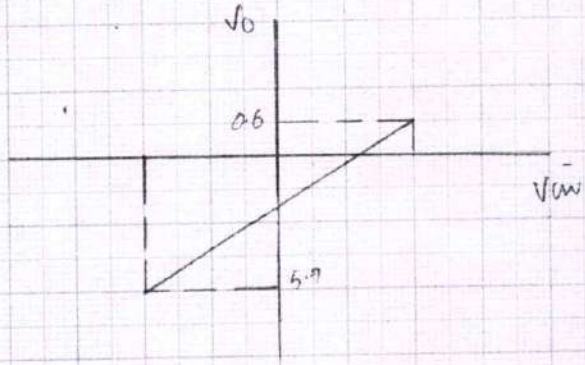
1) Positive clamper with clamping level at 0V



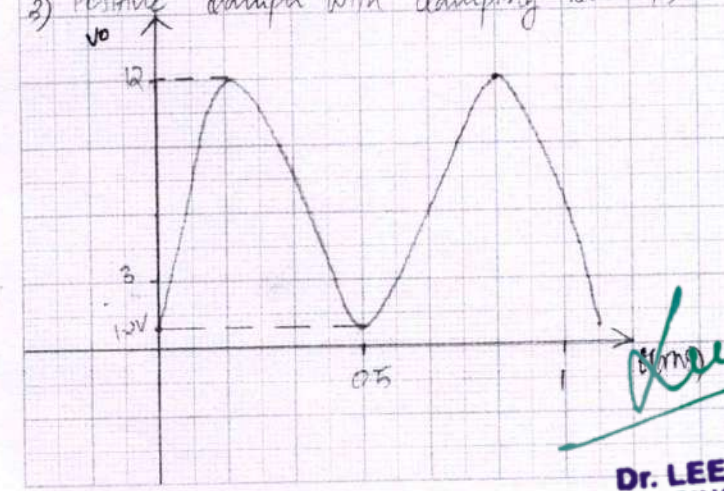


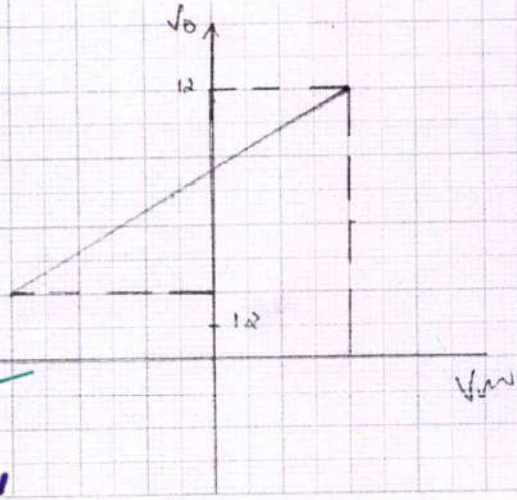
2) Negative clamper with clamping level at 0V





3) Positive clamper with clamping level +3V





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

eright side. The charging of the capacitor is limited to (Vm-3) volts due to the presence of the dc source. The output is then $V_o = (V_m - 3) + V_m \sin \omega t$.

Design:

Select 1N4007

The series resistance used for current limiting

Typical value of forward resistance $R_f = 30\Omega$ and $R_a = 300 k\Omega$

$R = 3k$. Use 3.3 kΩ standard.

$$R = \sqrt{R_f * R_a}$$

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROCEDURE : CLIPPING

1. Set up the circuit as per the circuit diagram

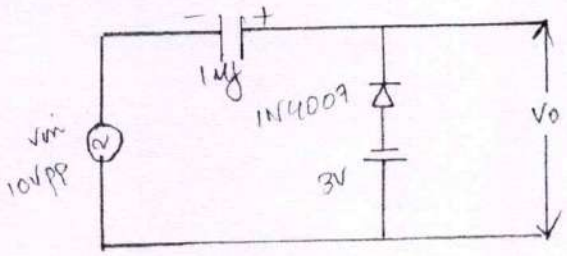
2. Apply 10 Vpp, 1KHz input sine wave to the circuit from the signal generator.

3. Observe the output wave forms on the CRO. Apply the input to x channel and output to channel Y and observed the waveform simultaneously. Set AC DC coupling switch to DC mode

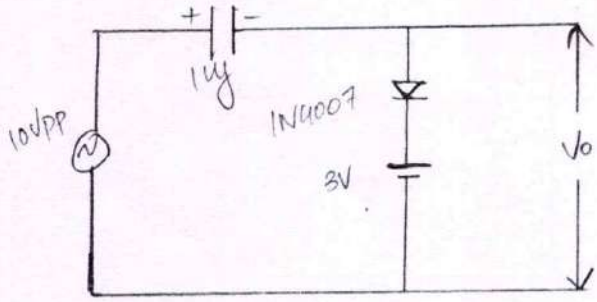
4. To observe the transfer characteristics, keep the x y mode switch pressed and view the output

5. Draw the output considering the diode drop.

5) Positive clamper with clamping level at -3V



6) Negative clamper with clamping level at +3V



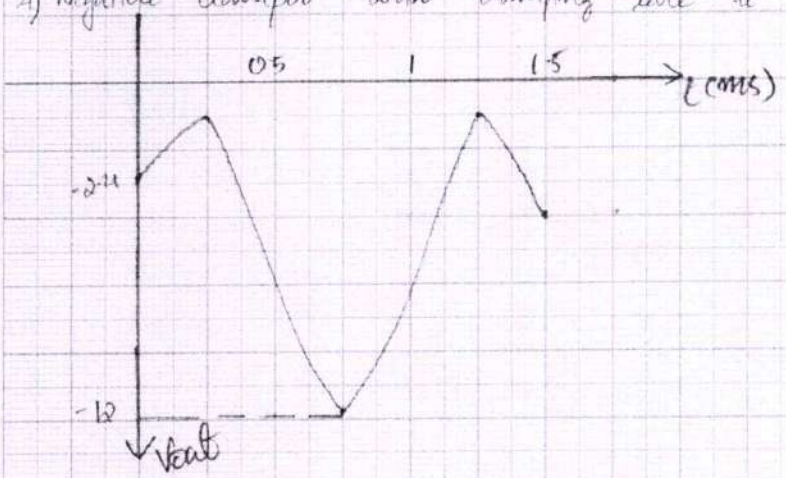
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

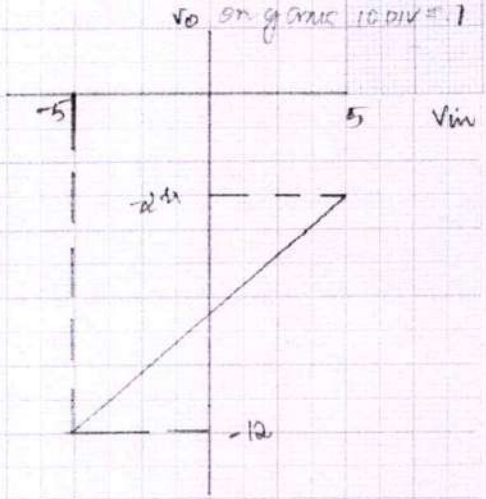
Scale

on x axis 10 DIV = 0.25

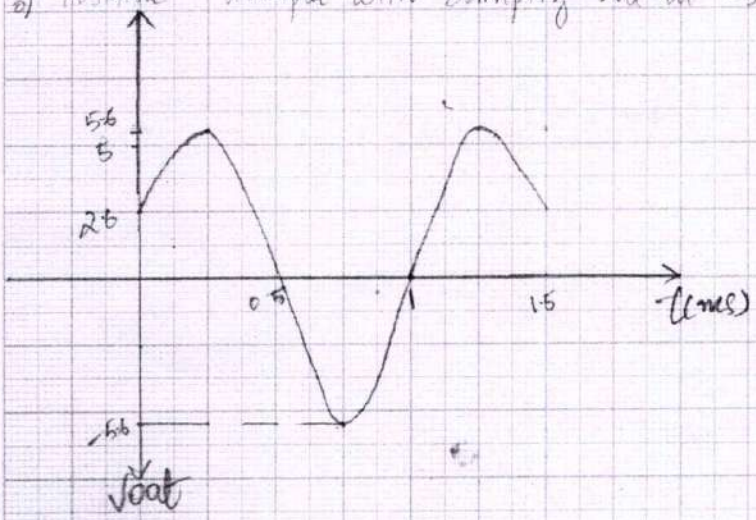
on y axis 10 DIV = 1

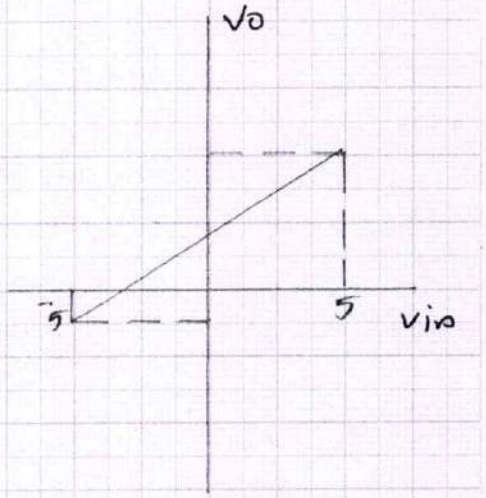
4) Negative clamper with clamping level at -3V



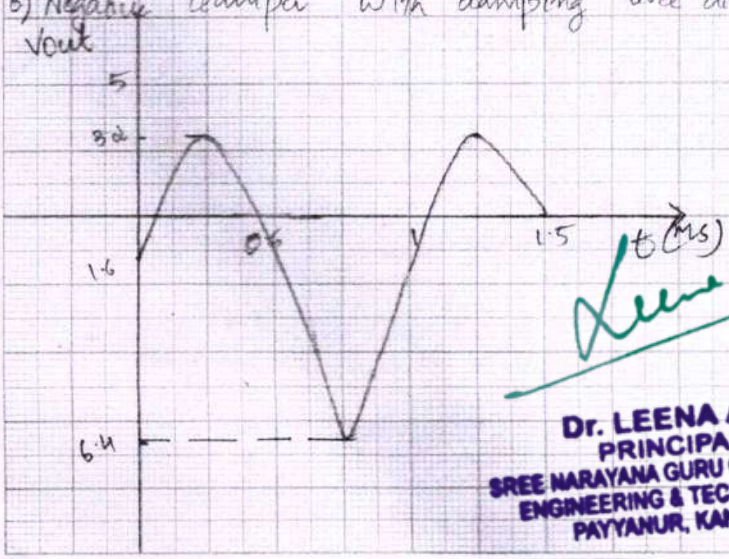


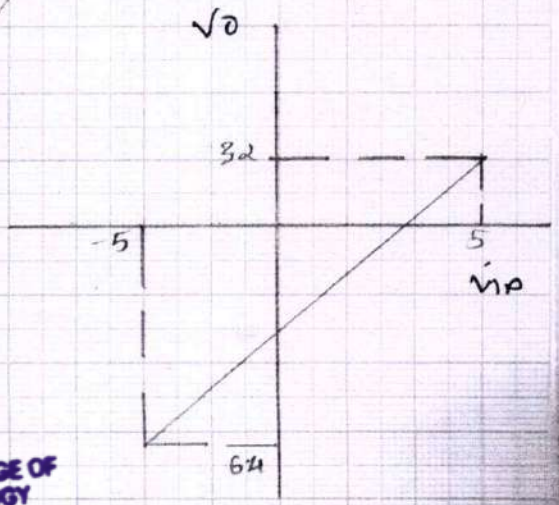
5) Positive clamper with clamping level at -3V





6) Negative clamper with clamping level at +3V





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROCEDURE:

CLAMPING:

1. Set up the circuit as the circuit diagram

2. Apply 10 Vpp, 1KHz input sine wave to the circuit from the signal generator.

3. Observe the output wave form on the CRO, Apply the input x channel and output to channel Y and observe the waveform simultaneously. Switch AC - DC coupling switch to DC mode

4. To observe the transfer characteristics, keep the XY mode switch pressed and view the output.

5. Draw the output considering the diode loop.

Procedure (15)	5
Conduction (5)	4
Result (15)	4
Viva (10)	8
Record (15)	5

RESULT:

Various clipping and clamping circuit are studied and plotted the output waveform and transfer characteristics.

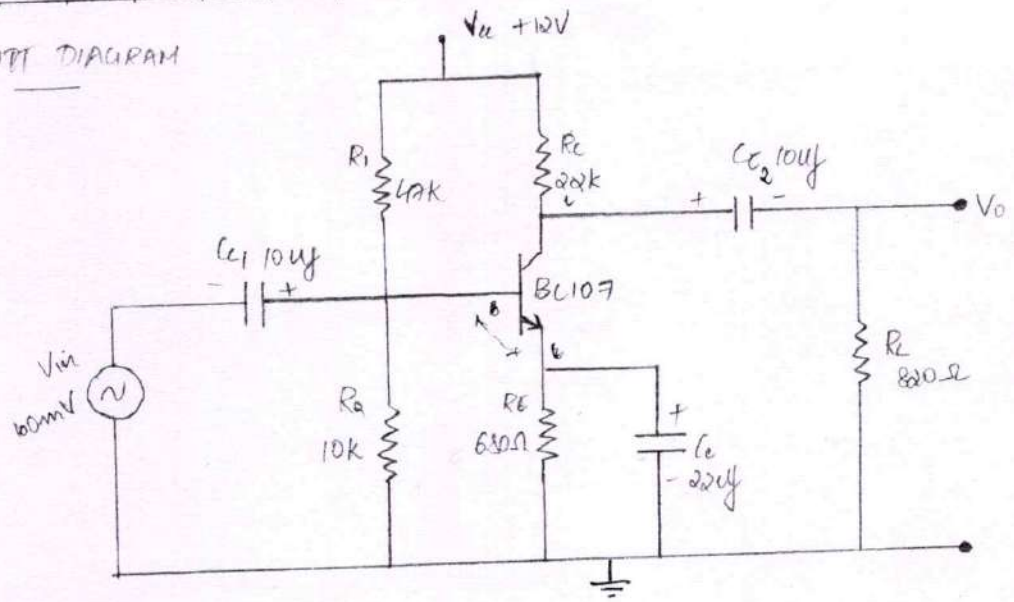
15/6/23

HOD ECE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature

CIRCUIT DIAGRAM



Design:

output requirements : Mid band voltage gain of the amplifier -50 and the required output voltage swing = 10V.

selection of Transistor : BC107

Design of RE:

$V_{RE} = I_E \times R_E = 1.2$ $\quad V_{RE} = 1.2/2\,mA = 600\,\Omega$: use $650\,\Omega$

Design of Rc

$V_{Rc} = I_c \times R_c = 4.8$ $\quad R_c = 4.8/2\,mA = 2.4\,K\Omega$ use $2.2\,K\Omega$

DC Biasing Condition

$V_{cc} = 12V$, $I_c = 2mA$

$V_{Rc} = 40\%$ of $V_{cc} = 4.8V$

$V_{RE} = 10\%$ of $V_{cc} = 1.2V$ and

$V_{CE} = 50\%$ of $V_{cc} = 6V$

Design of Potential divider R1 and R2:

$I_B = I_c/h_{FE} = 2mA/100 = 20\mu A$.

V_{R2} = Voltage across R2 = $V_{BE} + V_{RE} = 0.7 + 1.2 = 1.9V$

$V_{R2} = 9 I_B \times R_2$

$R_2 = 1.9/(9 \times 20\mu A) = 10.6\,K\Omega$ = use $10\,K\Omega$

V_{R1} = Voltage across $R_1 = V_{cc} - V_{R2} = 12 - 1.9 = 10.1V$

$V_{R1} = 10 I_B \times R_1$

$R_1 = 10.1/10 \times 20\mu A = 50\,K\Omega$ use $47\,K\Omega$

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RC COUPLED AMPLIFIER

AIM:

To design and setup an RC coupled CE amplifier using bipolar junction transistor and to plot its frequency response.

COMPONENTS AND EQUIPMENTS

SL NO	Components	Specifications	Quantity
1	Resistor	47K, 10K, 22K, 680Ω	1
2	Transistor	BC 107	1
3	capacitor	10μf, 10μf, 22μf	1
4	CRO		1
5	DC source		1
6	signal generator		1
7	connecting wire		1
8	Bread board.		1

THEORY:

RC coupled CE amplifier is widely used in audio frequency applications in radio and TV receivers. It provides current, voltage and power gains. Base current controls current of a common emitter amplifier. A small increase in base current result in relatively large increase in collector current. Similarly, a small

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:

Design of RL

Gain of the common emitter amplifier is given by the expression
$A_V = -(r_c/r_e)$ where $r_c = R_E \| R_L$ and $r_e = 25\,mV = 2E = 25\,mV/2\,mA = 12.5\,\Omega$
Since the required gain = 50, substituting it in the expression $R_L = 845\,\Omega$
use $820\,\Omega$ std.

Design of coupling capacitor C_{c1} & C_{c2}

X_{c1} should be less than the input impedance of the transistor.
R_{in} is series impedance.
Then $X_{c1} \le R_{in}/10$.
Here $R_{in} = R_1 \| R_2 \| (1+h_{FE})r_e$ we get $R_{in} = 1.1\,K\Omega$
Then $X_{c1} \le 110$.
$C_{c1} \ge 1/(2\pi f_L \times 110) = 14\,\mu F$. Use $15\,\mu F$ std.
Similarly $X_{c2} \le R_{out}/10 = 14\,\mu F$ Use $15\,\mu F$ std.
$X_{c2} \le R_{out}/10 = R_E$ Then $X_{cE} \le 240$.
so $C_{c2} \ge 1/(2\pi f_L \times 240) = 6.6\,\mu F$ Use $10\,\mu F$ std.

[$R_{out} = R_C$]

110
240
$f = 100$ 68

Design of bypass capacitor C_E:
$X_{CE} \le R_E/10$
then $C_E \ge 1/(2\pi \times f_L \times 100 \times 68) = 23\,\mu F$. Use $22\,\mu F$

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.:

decrease in base current cause large decrease in collector current. Similarly a small decrease in base current causes large decrease in collector current. The emitter - base junction must be forward biased and the collector base junction must be reverse biased for the proper functioning of an amplifier. an transistor is common emitter ac amplifier R_1 and R_2 are employed for the voltage divider bias of the transistor. voltage divider bias provides good stabilization. The input signal V_{in} is coupled through C_{c1} to the base and output voltage is coupled from collector through the capacitor C_{c2}. The input impedance of the amplifier is expressed as $Z_{in} = R_1 || R_2 || (1+h_{fe} r_e)$ and output impedance as $Z_{out} = R_c || R_L || R_e$ where R_e is the internal emitter resistance. The expression $= 25\,mV / I_E$. where 25 mV is temperature equivalent voltage at room temperature.

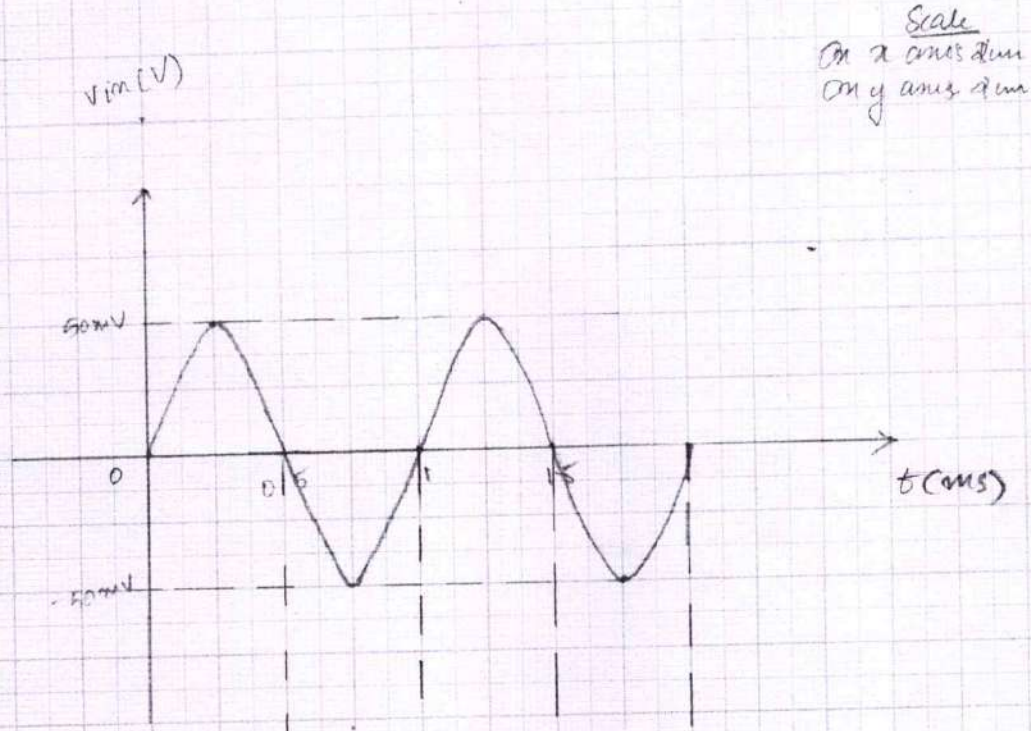
Selection of Transistor: Transistor is selected according to the frequency of operation and power required. low frequency gain of BJT amplifier is given by the expression voltage gain $A_V = -h_{fe} R_L/R_i$ in the circuit case with $R_L = R_i$, $A_V = -h_{fe}$. h_{fe} of any transistor will vary in large ranges. for BC 107 varies from 100 - 500. Therefore a transistor must be selected such that the minimum guaranteed h_{fe} is greater than or equal to A_V required.

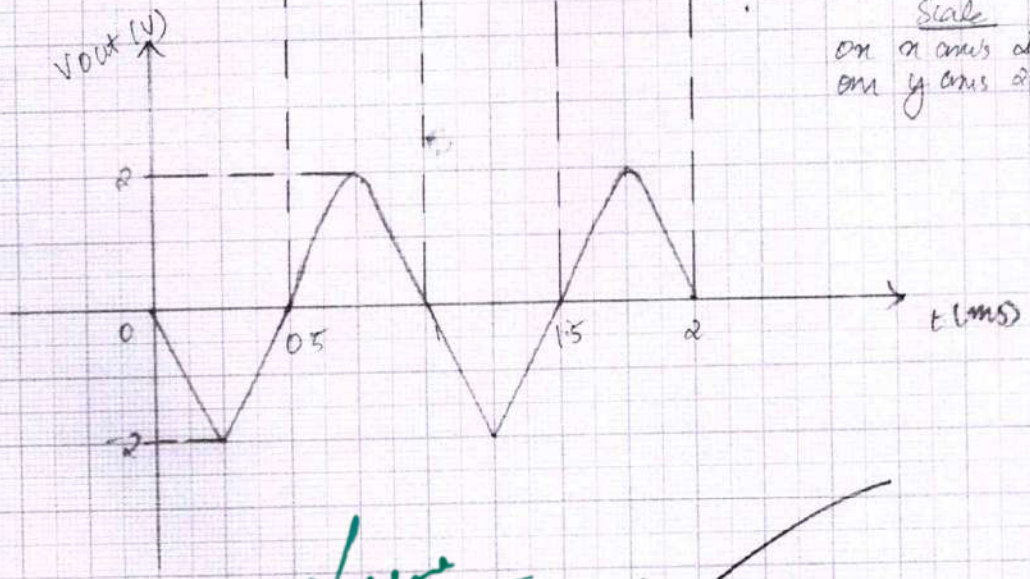
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Selection of supply voltage:-

Vce for a distortion less output from an oscillator from an audio amplifier, the

21 Coupled Amplifier





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

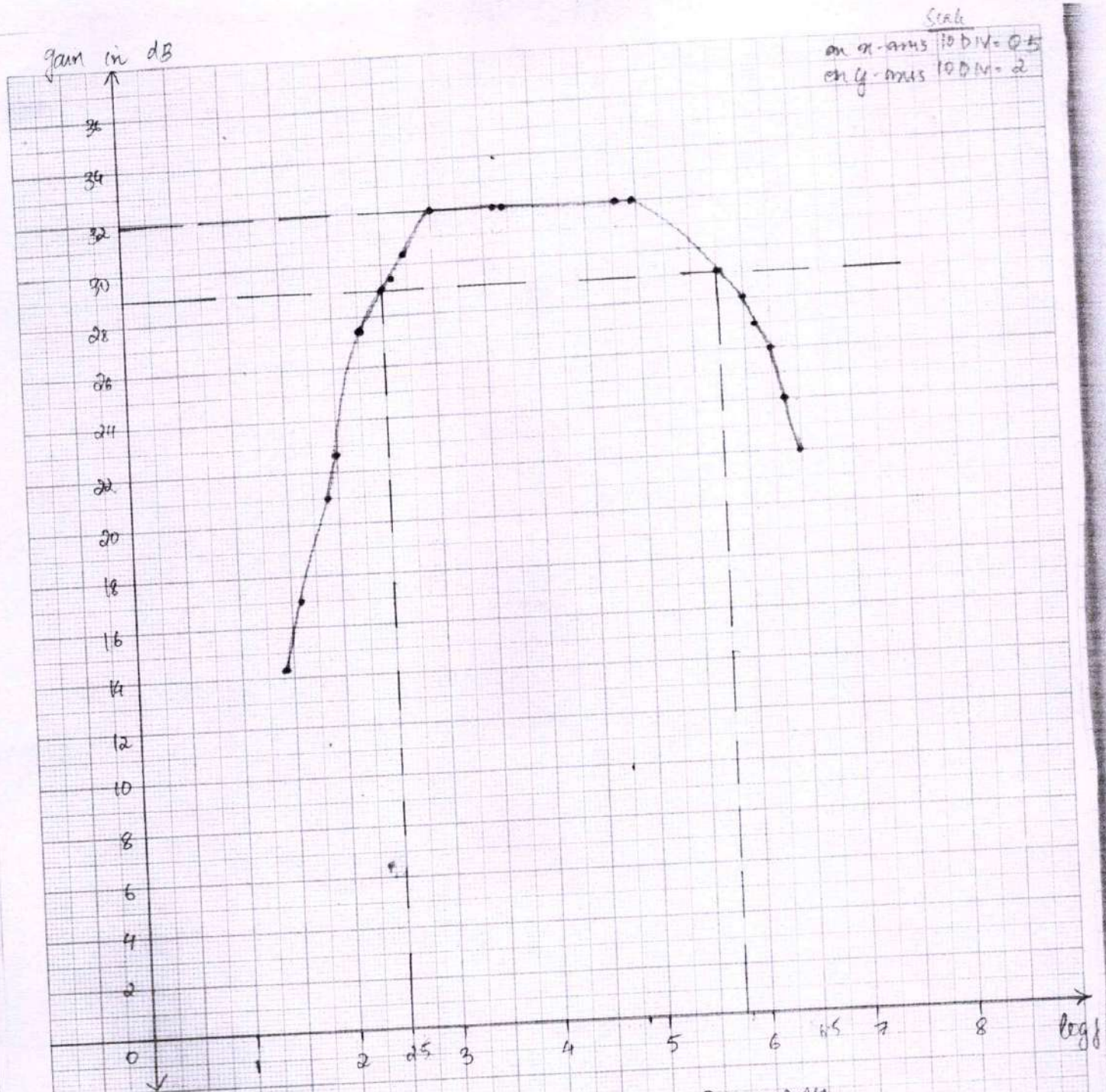
operating point must be kept at the middle of the load line selecting $V_{CEQ} = 50\% \cdot V_{CC}$. This means that the output voltage swing in either positive or negative direction is half of V_{CC}. However V_{CC} is 20% more than required voltage swing.

Selection of collector current I_C:
The nominal value of I_C can be selected from data sheet. Usually it will be given corresponding to h_{FE} max. It is the max current at which h_{FE} is measured. For BC107 it is 2mA and for power amplifier 2N3055 it is 4A.

Design of emitter resistance R_E:
Current series feedback is used in this circuit using R_E. It stabilizes the operating point against temperature variation. Voltage across R_E must be as high as possible.

Design of R_C: Value of R_C can be obtained from the relation $R_C = 0.4\, V_{CC} / I_C$
since remaining 40% V_{CC} is dropped across R_C.

Design of potential divider R_1 & R_2: Value of I_B is obtained by using the relation $I_B = I_C / h_{FE\,min}$. At least $10 I_B$ should be allowed through R_1 and $9 I_B$ through R_2 for the better stability of bias voltage. If the current through R_1 and R_2 is near to I_B, slight variation in I_B will affect the voltage across R_1 and R_2. For the other



log f_H = 6

f_H = antilog (6) = 10^6

= 1000000 Hz

log f_L = 2.5

f_L = antilog (2.5) = $10^{2.5}$

= 316.22 Hz

Band width

= 999874.11 Hz

= 999.87411 kHz

Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

the base current will load the voltage divider.

Design of Bypass Capacitor C_E :-
The purpose of the bypass capacitor is to bypass signal current to ground. To bypass the frequency of interest, X_{CE} component at the frequency should match less than the emitter resistance

Design of Coupling Capacitor C_C :- The purpose of the coupling capacitor is to couple the ac signal to the input of the amplifier and block dc. It also determine the lowest frequency that to be amplified. Value of the coupling capacitor C_C is obtained such that is its resistance X_C at the lowest frequency.

PROCEDURE :-

1. Test all the components using a multimeter. Set up the circuit and verify dc bias conditions. To check dc bias condition, remove input signal & capacitor in the circuit.
2. Connect the capacitor in the circuit. Apply a 100 mV peak to peak sinusoidal signal from the function generator to the circuit input. Observe the input and output waveform.
3. Keep the input voltage constant at 100 mV, vary the frequency of the signal from 0 to 1MHz or highest frequency available generator. Measure the output amplitude

Dr. LEENA M
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.:

RESULT :-

Designed and setup an RC coupled amplifier and studied its frequency response

with CE :-

Used bias gain of the amplifier = 32 dB

Bandwidth of the amplifier = 999.6 KHz

21/06/23

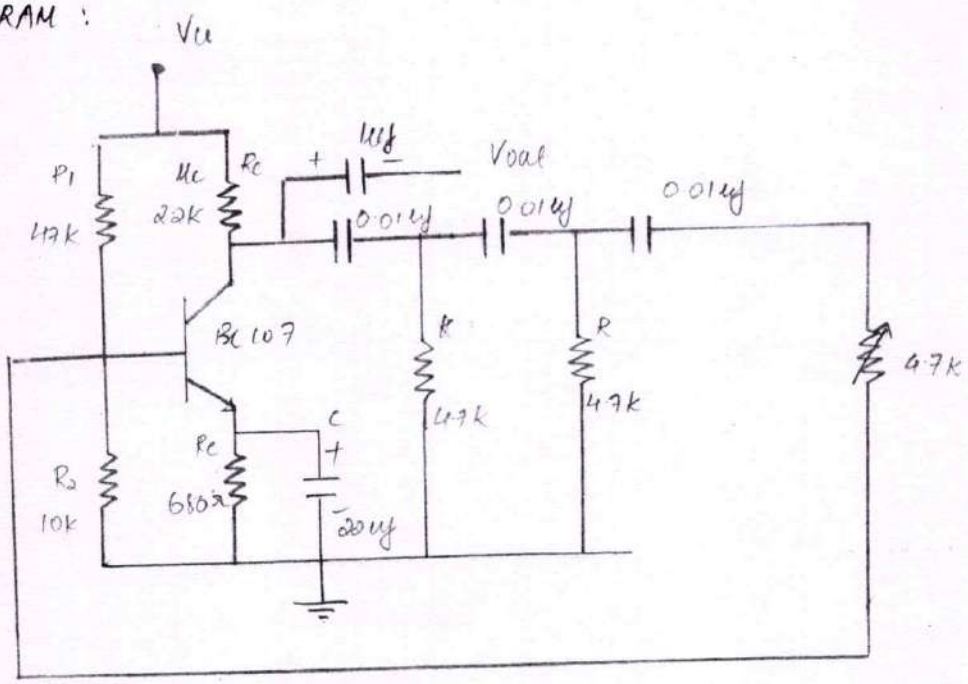
Procedure (5)	5
Conduction (5)	4
Result (5)	5
Viva (10)	8
Record (5)	5

HOD ECE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:

CIRCUIT DIAGRAM :



DESIGN:

output Requirements : Sine wave with amplitude 10Vpp and frequency 1KHz

Design of the amplifier : Select transistor BC 107. It can provide a gain more than 29 because its minimum hFE is 100

DC Biasing Condition:

$V_{CE} = 12V$, $I_C = 2mA$,

$V_{RC} = 40\%$ of $V_{CC} = 4.8V$

$V_{RE} = 10\%$ of $V_{CC} = 1.2V$ and

$V_{CB} = 50\%$ of $V_{CC} = 6V$

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RC PHASE SHIFT OSCILLATOR

AIM:

To design and setup an RC phase shift oscillator using BJT and to observe the sinusoidal output waveform.

COMPONENTS AND EQUIPMENTS REQUIRED:

COMPONENTS	SPECIFICATIONS	QUANTITY
1. Transistor	BC 107	3
2. Capacitor	0.01 μf, 1μf, 22 μf	3, 1, 1
3. Resistor	47K, 10K, 4.7K, 680, 22k	1, 1, 2, 3, 3
4. Potentiometer	4.7 K (pot)	1
5. Bread Board		
6. CRO		
7. DC Source		

THEORY:

An oscillator is an electronic circuit for generating an ac signal voltage with a dc supply as the only input requirement. The frequency of the generated signal decided by the circuit element. An oscillation requires an amplifier, frequency selective network and a positive feedback path to the output to the input. The Barkhausen criteria for the feedback factor. The unity gain means signal 5 in phase

Design of RC

$V_{RC} = I_C \times R_C = 4.8$

$V_{RC} = 4.8/2mA = 2.4K\Omega$, use $2.2K\Omega$

Design of RE:

$V_{RE} = I_E \times R_E = 1.2$

$V_{RE} = 1.2/2mA = 600\Omega$ use 680Ω

Design of R_1 & R_2

$I_B = I_C/h_{FE} = 2mA/100 = 20\mu A$

Assume the current through $R_1 = 10I_B$ and that through divider by the base current.

$V_{R2} = 9I_B \times R_2$, $R_2 = 1.9/9 \times 20\mu A = 10.6K\Omega$ use $10K\Omega$

V_{R1} = Voltage across $R_1 = V_{CE} - V_{R2} = 12 - 1.9 = 10.1V$

$V_{R1} = 10I_B \times R_1$ $R_1 = 10.1/10 \times 20\mu A = 50K\Omega$ use $47K\Omega$

Design of Bypass Capacitor CE

$X_{CE} \le R_E/10$ Then $C_E \ge 1/(2\pi \times 100 \times 68) = 23\mu f$ use $47\mu f$

Design of frequency selective Network

$F = 1/2\pi RC\sqrt{(6+4RC/R)} = 1KHz$

The frequency determined by R & RC must be selected in such a way to avoid loading of amplifier so R is taken as 2RC

$R = 2RC = 2 \times 2.4K = 4.8K$ use $4.7K\Omega$ Then

$C = 1/(2\pi \times 4.8 \times 10^3 \times 1 \times 10^3\sqrt{8})$ $C = .014\mu f$ use $.01\mu f$

Tabular Column:

DC condition:

DC condition	V_{CC}	V_{R1}	V_{R2}	V_{RC}	V_{RE}	V_{CE}
Theoretical	12V	10.1V	1.9V	4.8V	1.2V	6V
Practical	12V	10V	2V	4.6V	1.4V	

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.:

Camlin Page No. 27
Date / /

d. Connect the feedback network and observe the sine wave measure it amplitude and frequency.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Procedure (5)	5
Conduction (5)	4
Result (5)	5
Viva (10)	8
Record (5)	5

RESULT:

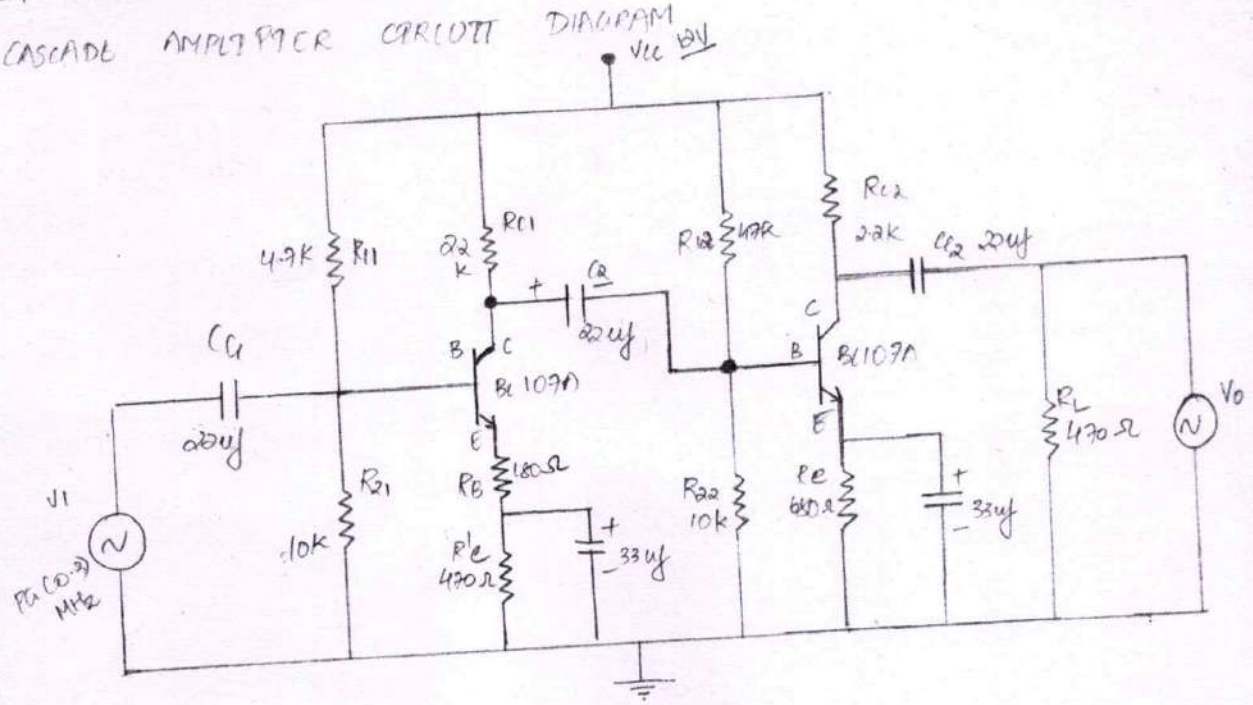
Designed and setup the RC phase shift oscillator and obtained the output.

HOD ECE

21/06/23

Teacher's Signature:

CASCADE AMPLIFIER CIRCUIT DIAGRAM



F (Hz)	Vo (V)	log f	Gain
30 Hz	0.6	1.47	29.54
100 Hz	1.2	2	35.56
300 Hz	2	2.47	40
1 KHz	2.4	3	41.58
2 KHz	2.5	3.3	41.9
5 KHz	2.5	3.69	41.9
10 KHz	2.5	4	41.9
50 KHz	2.5	4.69	41.9
100 KHz	2.4	5	41.58
200 KHz	2.3	5.30	41.21
500 KHz	2.2	5.47	40.8
350 KHz	2	5.54	40
700 KHz	1.9	5.84	38.58
1 MHz	1.6	6	38.06
1.5 MHz	1.2	6.17	35.56
2 MHz	1	6.30	33.97
3 MHz	0.7	6.47	30.88

$\left[20\log \frac{V_o}{V_{in}}\right]$ $20\log \frac{V_o}{(20\times10^{-3})}$ $20\log \frac{V_o}{0.02}$

Design:

output requirement: Mid band voltage gain of the amplifier

selection of transistor: select transistor BC107

Assume gain $A_1 = 4$ & $A_2 = 25$. Since $A = A_1 A_2$

A_1 should be lower value to avoid high input voltage to second stage high input

DC Biasing condition

$V_{CC} = 12V$, $I_C = 2mA$, $V_{RC} = 40\%$ of $V_{CC} = 4.8V$

$V_{RE} = 10\%$ of V_{CC} and $V_{CE} = 50\%$ of V_{CC}

Design of RC1 & RC2: take $R_{C1} = R_{C2} = R_C$ $V_{RC} = I_C R_C$

$V_{RC} = 4.8V$, $R_C = 2.4k$ use 2.2k std

Design of RE1 & RE of first stage is split into R_E & R'_E

$V_{RE} = I_E \times R_E = 4.8V \Rightarrow R_E = 2.4k$ use 2.2 std

$V_{RE} = I_E \times R_E$ Because $I_E \approx I_C$ $V_{RE} = I_C \times R_E$

$= 12V$. $\Rightarrow R_E =$

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.: 5

Camlin Page No. 28
Date 15 06 2023

CASCADE AMPLIFIER

AIM:

To design, set up and study a two stage RC couple CE amplifier using BJT

COMPONENTS REQUIRED

SL NO.	APPARATUS	RANGE	QUANTITY
1	function generator	0-3 MHz	1
2.	CRO	0-3 MHz	1
3.	Bread Board	10 kΩ (2)	1
4.	Resistor	47kΩ 22k, 680Ω 270Ω	
5.	capacitors	0.01μf, 10μf	
6.	Transistor	BC107	2
7.	connecting wire	Single strand	as required
8.	Power supply	(0-30 V)	1

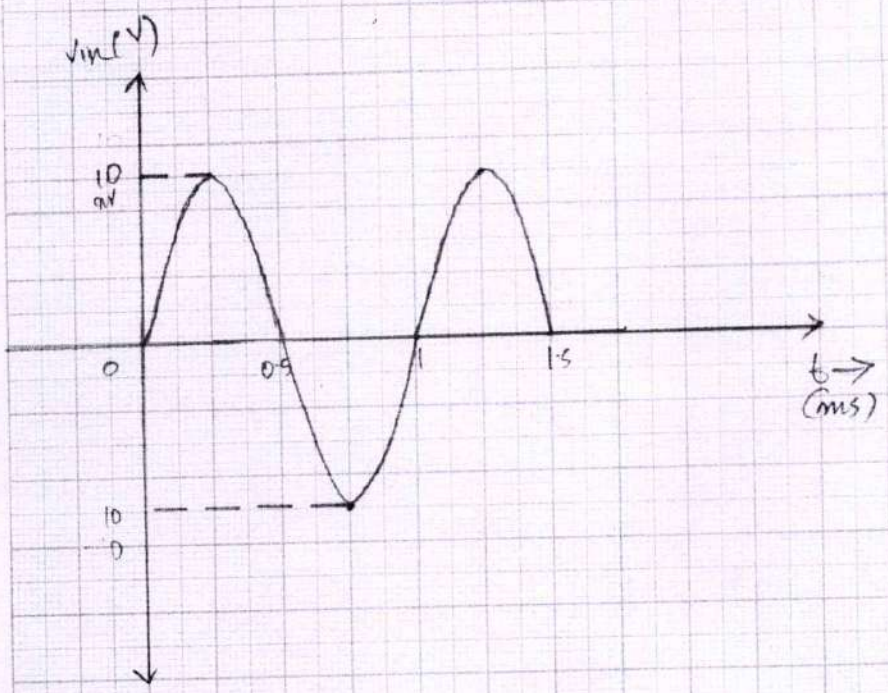
THEORY:

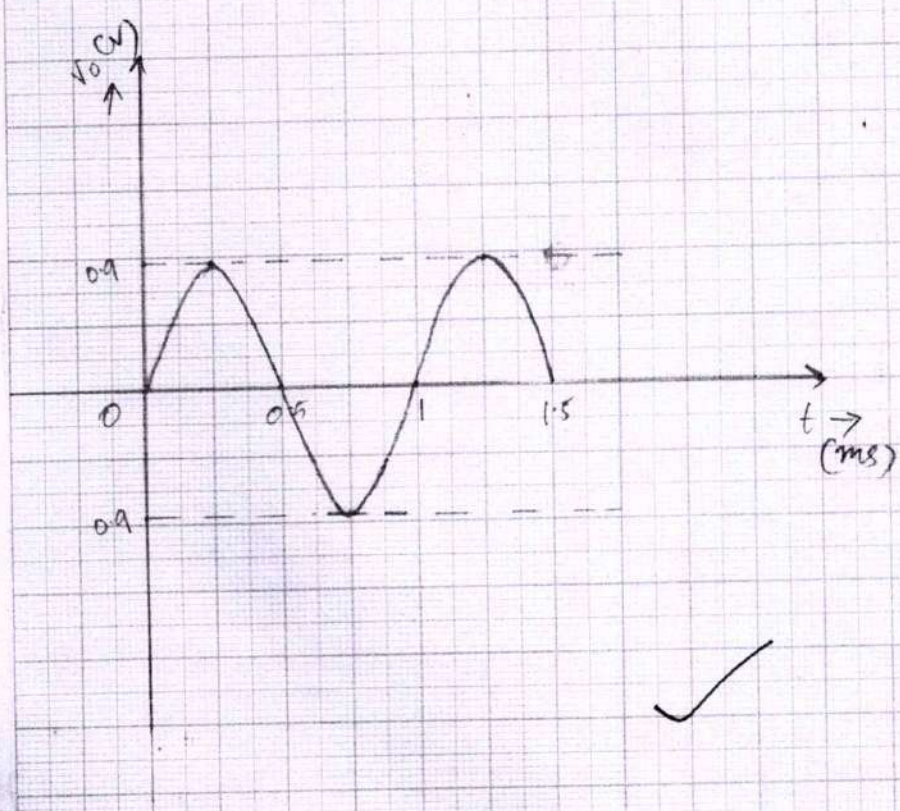
Multistage amplifier are used in cascade to improve parameters such as voltage gain current gain, input impedance and output impedance etc. common emitter stage are used to increase the voltage gain. A two stage amplifier provide an overall voltage gain $A_1 A_2$. where A_1 & A_2 are the gains of first and

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:

CASCADE AMP





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

second stage respectively - Since each stage provide a phase inversion. The final output signal is in phase with the input signal

The input impedance of the signal stage is in parallel with R_{C1} of the first stage. The ac voltage gain of the first style is $A_1 = R_{C1} || R_{in2} / (R_e + R_e)$ where R_{in2} is the input resistance of the second stage $R_{in2} = R_{B2} || R_{B2} || (1 + h_{fe} R_e)$

The ac voltage gain of the second stage is $A_2 = (R_{C2} || R_2) / R_e$

These type of amplifier circuits are employed in designing microphone and loudspeaker

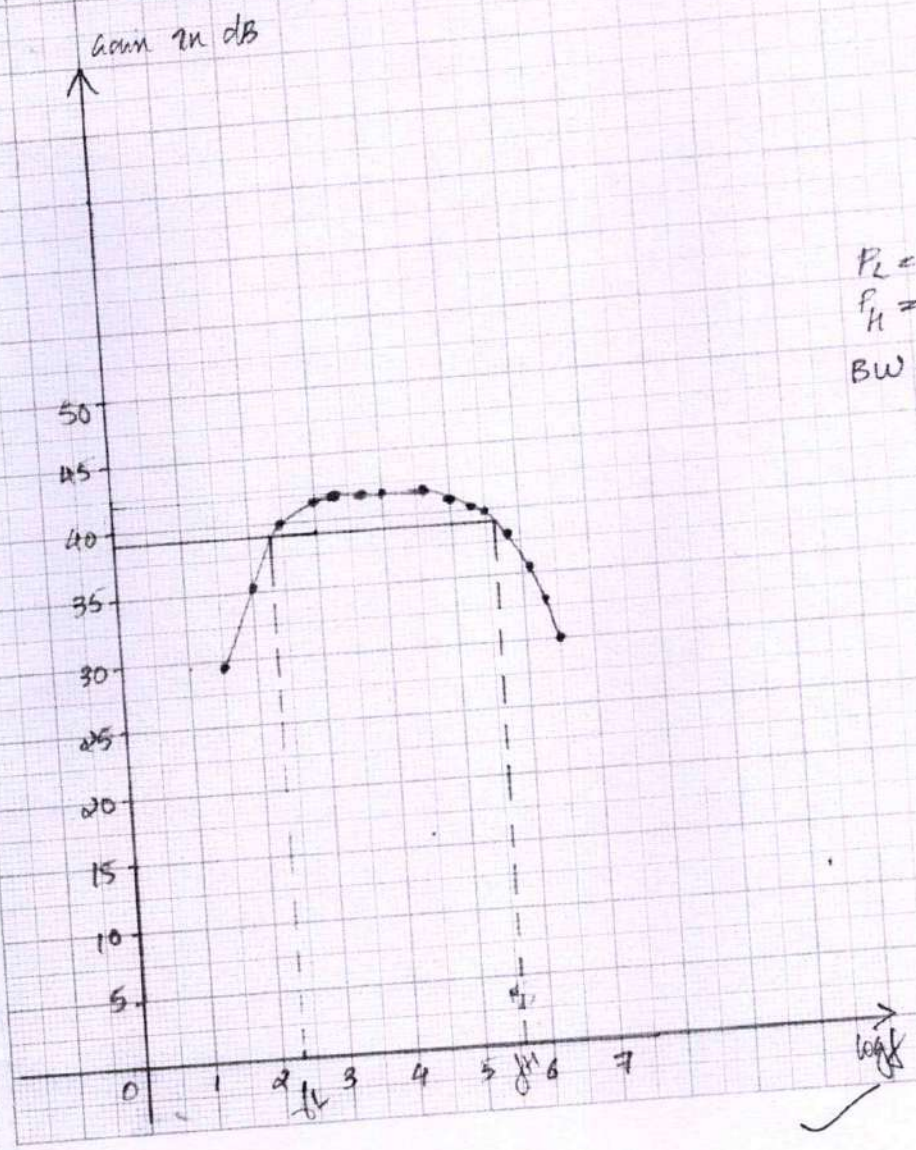
PROCEDURE:

1. Connect the circuit as per the circuit diagram

2. Determine the Q point of the amplifier using DC analysis

3. Determine Maximum input voltage that can be applied to amplifier using AC analysis

4. Set the input voltage $V_{in} = V_{MSH}/2$ and vary the input signal frequency from 0Hz to 1MHz in incremental steps and [illegible] corresponding output voltage V_o for atleast 20 different values for the considered range.



$f_L = 10^{2.3}$

$f_H = 10^{5.6}$

$BW = 10^{5.6} - 10^{2.3}$

$= 397\ KHz$

To bypass the lowest frequency (100 Hz). X_{CE} should be less than or from a equal to the resistance R_E.

i.e $X_{CE} \leq R_E/10$

Then

$C_E \geq 1/2\pi \times 100 \times 68$

$= 23\ \mu f$

Use $33\ \mu f$ //

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

min is 100.

$I_B = I_C / h_{FE} = 2mA / 100 = 20\mu A$. Assume $R_i = 10 I_B$ and that $R_2 = 9 I_B$ for the stability of the potential divider bias current.

V_{R2} - voltage across $R_2 = V_{CE} + V_{RE}$

$V_{R2} = V_{BE} + V_{RE} = 0.6V + 12V = 1.8V$ also $V_{R2} = 9 I_B R_2 = 18V$

Then $R_2 = 1.8/9 \times 20 \times 10^{-6} = 10K$

V_{R1} = Voltage across $R_1 = V_{CC} - V_{R2} = 12V - 1.8V = 10.2V$ / $V_{R1} = 10 I_B R_1 = 10.2V$

Then $R_1 = \frac{10.2}{10 \times 20 \times 10^{-3}} = 51k$

Design for R_E and R_E'

$A_1 = \frac{R_C \| R_{in}^2}{(R_C + R_E)}$ $R_e = R_E - R_E'$ and $R_{in}^2 = R_1 \| R_2 \| (1 + h_{FE} r_e) = 1.1\Omega$. / $r_e = 25mV$

$I_E = 25mV/2 = 12.5\Omega$ / $R_e = R_E - R_e = 680\Omega - 180\Omega = 500\Omega$

$R_e = 173\Omega$ Use 180Ω. use 470Ω

Design of R_C

Gain of the second stage is given by the expression $A_2 = (R_C \| R_L)/r_e = 25$

$R_C = 363\Omega$. Use 470Ω

Design of coupling capacitor (C_1 & C_2 and C_3). to permit the lowest frequency f_c (say 100Hz). X_{C1} should be less than or equal to the i/p resistance R_{in1}.

$X_{C1} \le R_{in}/10$. Here $R_{in} = R_1 \| R_2 \| (1 + h_{FE}) R_e = 1.1K$ 22 µf std.

Then take $C_{C2} = C_{C3} = C_{C4} = 22\mu f$ because of i/p impedance of second stage

Design of Bypass capacitor C_E

To bypass the lowest frequency (100Hz). X_{CE} should be less than or from a equal to the resistance R_E.

i.e $X_{CE} \le R_E/10$

Then

$C_E \ge 1/2\pi \times 100 \times 68$

$= 23\mu f$

Use $33\mu f$ //

Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

[redacted]

Experiment Name / No.:

Camlin Page No. 30
Date / /

5. The voltage gain calculated as
[$A_V = 20 \log (V_o/V_i)$ dB]

6. Find the Bandwidth and gain - Bandwidth product from semi-log graph taking frequency on x - axis and gain in dB on y-axis.

RESULT: Obtained And Verified the output of Cascade Amplifier.
BW = 397 KHz

10/7/23

Procedure	5
Conduction	4
Result	4
Viva	8
Record	4

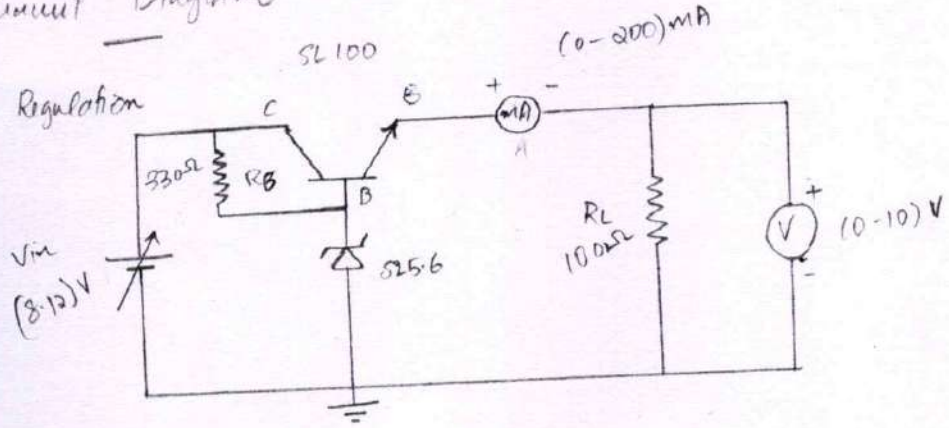
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD ECE

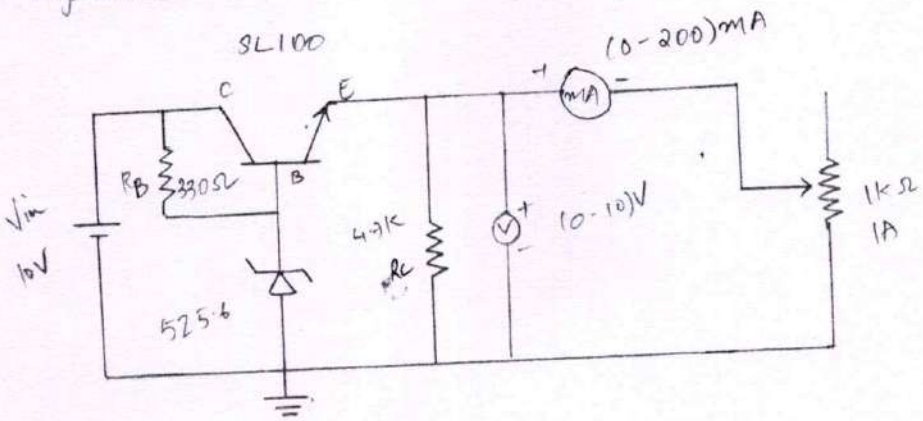
Teacher's Signature

Circuit Diagram

1) Line Regulation



2) load Regulation



Design:

Since $I_L = 50mA$ SL100 is used. Nominal voltage of SL 100 is $V_{CE} = 5V$,

$\beta_1 = 150$ mA $\beta_{fc} = 40-300$

Requirements : $V_{out} = 5V$, $I_L = 50mA$ $V_{in} = (8-12)V$

Selection of Zener diode $I_{Z\,min} = 10mA$ $I_{Z\,max} = 30mA$

Selection of RB:

$R_{B\,max} = V_{in\,max} - V_Z / (I_{Z\,(min)} + I_B) = 12-5.6 / (10+0.7)mA = 597.6\,\Omega$

$R_{B\,min} = V_{in\,min} - V_Z / (I_{Z\,(max)} + I_B) = 8-5.6 / (30+0.7)mA = 77.4\,\Omega$

$R_B = (R_{B\,max} + R_{B\,min})/2 = 338\,\Omega$ (use $330\,\Omega$)

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.: 6

Camlin Page No. 31
Date 21 06 / 2023

SERIES VOLTAGE REGULATOR (TWO TRANSISTORS)
LINE AND LOAD CHARACTERISTICS

AIM:

To design and set up a series voltage regulator - line & load characteristics

COMPONENTS AND EQUIPMENTS REQUIRED:

Transistor 2N3055, BC107	-	1, 1 No
Resistor 470Ω, 680Ω, 390Ω	-	1, 2, 1 No
Rheostat 1KΩ	-	1 No
Capacitor 0.1μF (2)	-	1 No
Regulated Power supply 0-15V	-	1 No
Ammeter (0-1)A	-	1 No
Voltmeter (0-30)V	-	1 No
Diode SZ5.6	-	1 No
Bread Board	-	1 No
CRO		
Connecting wires		

THEORY:

The circuit is quite similar to that of a simple transistor series voltage regulator except that transistor Q2 is connected to the negative supply through a Zener diode. The base of transistor is connected to the variable tap of a potentiometer.

Dr. LEENA A.V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature

Selection of RL (load regulation): $I_L = 1mA$

$R_L = V_{out}/I_L = 5/1mA = 5k\Omega$ use $4.7k\Omega$

Selection of RL (line regulation):

$R_L = V_{out}/I_L = 5/1mA = 5k\Omega$ use $47k\Omega$

$= 5/50mA = 100\Omega$

Power rating of $R_L = I_L^2 R_L = (50mA)^2 * 100 = 0.25W$ use 100Ω, 0.25W resistor

1. Line Regulation

Vin (V)	Vo (V)
8V	4.70
9V	4.75
10V	4.77
11V	4.8
12V	4.83

2. Load Regulation

I_L (mA)	Vo (V)
5	5.36
10	5.34
20	5.33
30	5.33
40	5.33
50	5.31
60	5.31
70	5.29
80	5.29
90	5.29
100	5.28

Calculation:

Percentage line regulation:

$= (\Delta V_{out} / \Delta V_{in}) \times 100$

$= \frac{4.83 - 4.70}{12 - 8} \times 100$

$= 0.0325 \times 100$

$= 3.25\%$

Calculation:

Percentage load Regulation

$= \frac{V_{NL} - V_{FL}}{V_{FL}} \times 100$

$= \frac{5.37 - 5.28}{5.28} \times 100$

$= 0.0174 \times 100$

$= 1.704\%$

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

This voltage regulator employs the principle of negative feedback to hold the output voltage almost constant despite variations in supply voltage and / or load current. The Q_1 transistor is the control element, is called the pass transistor. The voltage divider consisting of resistor R_1 and R_2 samples the output voltage and delivers a negative feedback.

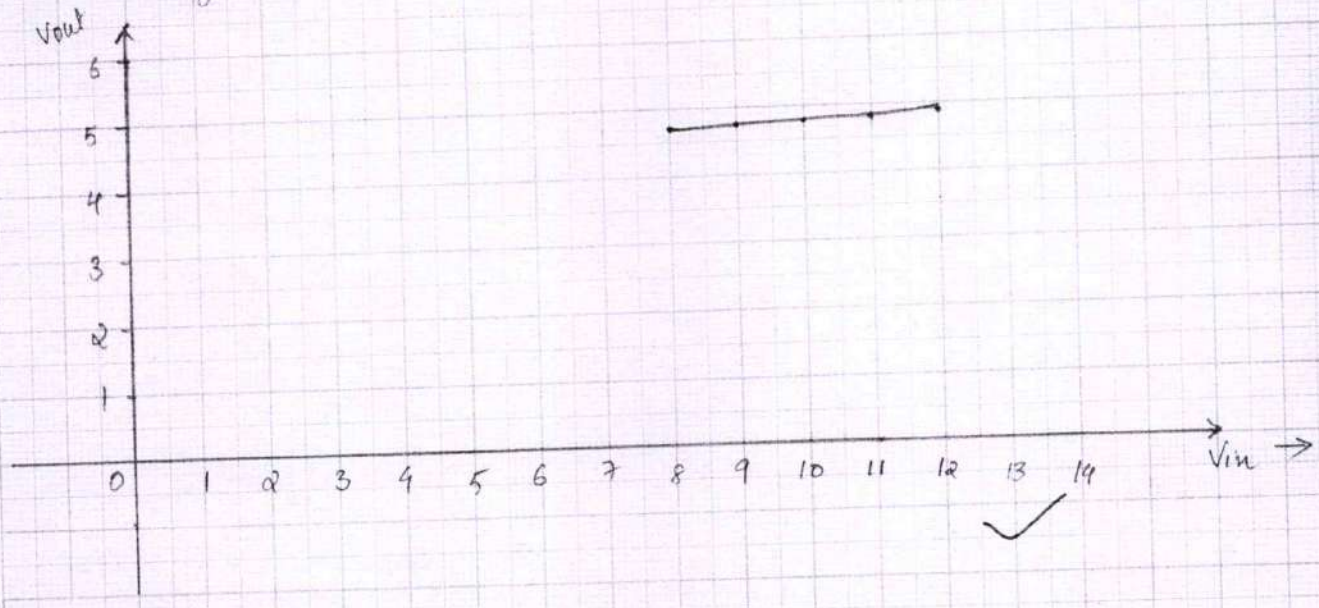
Operation:

Suppose the output voltage increases, the voltage across R_2 is also increased as it is part of the output circuit. This causes an increase in voltage $(V_{BE2} + V_Z)$. As a result I_{B2} and I_{C2} increase. Assuming I_B relatively constant, I_B decreases. Decrease in base current of transistor Q_2 causes the increase in collector - emitter resistance of transistor Q_1. This causes an increase in V_1 thereby offsetting the increasing in output voltage. Therefore output voltage remain constant. Reverse happens should the output voltage decrease. The voltage V_Z provided by $R_1 - R_2$ must be equal to the sum of the base emitter voltage of transistor Q_2 and the Zener diode. Thus the regulated output voltage is equal to the closed - loop gain multiplied by the sum of Zener diode voltage and base - emitter voltage of transistor Q_2. Like emitter follower regulator. This regulator also has the drawback of excessive power dissipation. Due to this high power dissipation output of circuit is limited to 30 - 40 V, as safe value of V_{CE} is 50 V. Another drawback of this regulator is that it has no overload /

Observation

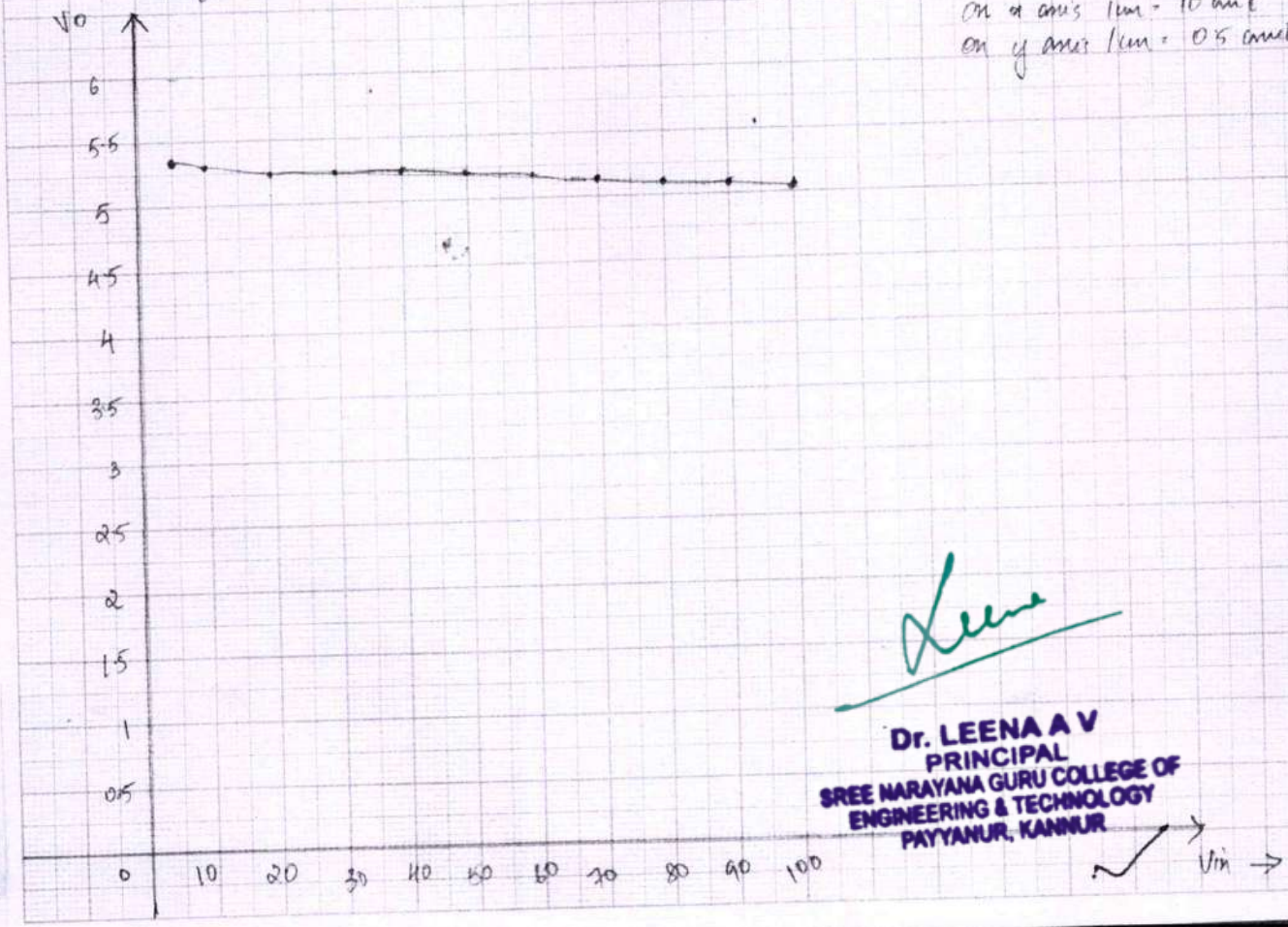
Scale
on x axis 1cm = 1 unit
on y axis 1cm = 1 unit

Line Regulation



Load Regulation

Scale
on x axis 1cm = 10 unit
on y axis 1cm = 0.5 unit



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

short circuit protection

PROCEDURE:

Line regulation :

1. Set up the circuit. Vary the input voltage and measure the corresponding output voltage
2. Plot the Vo V Vin which gives line regulation curve. From this, calculate the percentage line regulation factor Sv using the expression.

Load Regulation:

1. Vary the load resistance and measure the load current and corresponding load voltage. Plot the load regulation graph.
2. Mark the no-load output voltage V_{NL} and full load output voltage V_{FL} on this graph. V_{NL} corresponds to voltages without load and full load means voltage at rated current.
3. Calculate the load regulation factor using the expression
4. Calculate the output impedance using the expression.

RESULT:

Series voltage regulator circuit is set and stretched studied, plotted load & line regulation characteristics.

% line regulation = 8.25 %
% load regulation = 1.704 %

Procedure	5
Conduction	4
Result	4
Viva	7
Record	5

Teacher's Signature

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD ECE

10/7/23

FAMILIARISATION OF PSPICE SIMULATION SOFTWARE

AIM: To familiarize with PSPICE simulation software environment

THEORY:

ORCAD is a property software tool suite used primary for electronic design automation (EDA). The software is used mainly by electronic design engineers to create electronic schematic and electronic parts for manufacturing printed circuit board. The name or-cad is a portmanteau, reflecting the company and its software design.

ORCAD is a suite of products for EDA and includes a schematic editor, a circuit simulator and a PCB designer. OCAD capture.

ORCAD is a schematic capture application, and part of the ORCAD circuit design suite. Capture is a design entry program you need to prepare your circuit for simulation.

When the simulation process begins, capture first generate files describing the parts and connections in the circuit. These files are the netlist file and the circuit file. Capture imports netlist data to the simulator OCAD EE. Capture can also export a hardware description of the circuit OCAD ~~EE~~ Pspice.

The simulation program with Integrated Circuit Emphasis (SPICE) became an industry standard for circuit simulation. The PC-compatible version (PSPICE) is

DR. LEENA A.V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

here. Pspice is an acronym for personal simulation program with Integrated Circuit Emphasis. Pspice was a modified version of the academically developed SPICE, and was commercialized by Microsim in 1984.

OrCAD EE Pspice is a SPICE circuit simulation application for simulation and verification of analogue and mixed signal circuit. Pspice can be together thought of as a software based breadboard of your circuit that you can use to test and refine your design before ever touching a piece of hardware. A circuit to be analyzed using Pspice is described by a circuit description file, which is processed by Pspice and executed as a simulation. Pspice creates an output file to store the simulation results, and such results are also graphically displayed within the OCAD EE interface. Pspice uses high-resolution graphics so you can view the result of a simulation both on the screen and in printed form.

Analyses:

This type of simulation performed by Pspice depends on the source specification and control statements.

- DC Analysis :- It is used for circuits with some internal source. It calculate all nodal voltage and branch current over a range of values. Supported types include linear sweep, logarithmic sweep and sweep over list of values.
- Transient Analysis :- used for circuit with time variant source.

- Ac Analysis : It is used for small signal analysis of circuit with source of varying frequencies. It calculate the magnitude and phase angle of all nodal voltages and branch current over a range of frequencies.

Minimum requirement to run a DC sweep analysis :
- Voltage source with a DC specification
- Current source with a DC specification.

Minimum requirement to run a transient analysis :
- An independent source with a transient specification
- An initial condition on a reactive element.
- A controlled source that is a function of time

Pspice Output file :
The Pspice output file an ASCII text file that contains :
- The netlist representation of the circuit
- The Pspice command syntax for simulation command and options.
- simulation results and
- warning and error message for problems encountered during read in or simulation.
- The type of analysis you run
- the option you select for running Pspice

Pspice circuit file :
A Pspice circuit description file contain the configuration data for circuit simulation.

ORCAD CE PSpice simulator. The circuit file contains the component netlist, simulation option, analysis statement, and the output control statement. The component netlist comprises a list of all circuit elements, along with the node names connected to their terminals.

Circuit files:

The file contain 5 types of statements :-

- The Title
- Device Statements
- Control statements
- Comment lines
- The End statement

Steps for circuit analysis :

There are 4 main steps involved in circuit simulation using PSpice.

Step 1: Creating New Project and Schematic Diagram.

Step 2: Selecting circuit components connecting them together and setting components

Step 3: Creating a New simulation Profile and setting up the simulation.

Step 4: simulating the circuit and observing the simulation results.

To Create a New PSpice Project:

1) From the window start menu choose the ORCAD 16.0 program folder and there then ORCAD Capture to start Capture.

2) Create a project [File] → [New] → [Project]. Name the project and choose Analog or Mixed location
3) Select [Place] → [Part]. Place necessary circuit components.
4) Find the part you want to add and press OK.
5) Click where you want to place the part on your schematic.
6) When you are finished with the part, right click and select End Mode to return to the pointer.
7) Select Parts ⇒ Wire. The pointer changes to wire.
8) Drag mouse from one connection point to another. Clicking on any valid connection wire end the wire.
9) When you are finished, right click the mouse and select End Wire to return to the pointer.
10) PSpice use node-voltage method for circuit simulation and therefore, need a reference node with (zero voltage)
11) To change a parts value double click the value of the part.
12) Aliases can be used to label the input and output nodes.
13) Set up the required analysis [PSpice] → [New Simulation Profile]. Name the new profile
14) After the parameters are set you can start simulation from capture in either following ways:-
   - From the PSpice menu select Run
   - Click the simulate button on the PSpice toolbar.
15) A new window will pop up that can display what PSpice calls traces. If the desired trace is not displayed then click [Trace] → [Add Trace].

RESULT: PSPICE simulation software environment is familiarized.

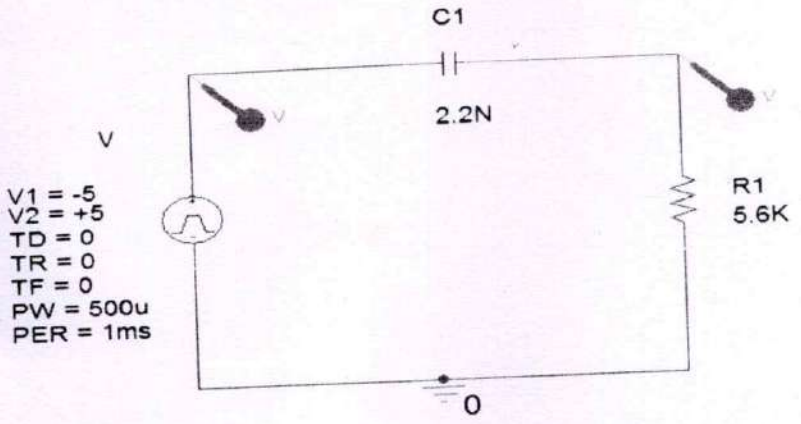
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR.

HOD ECE

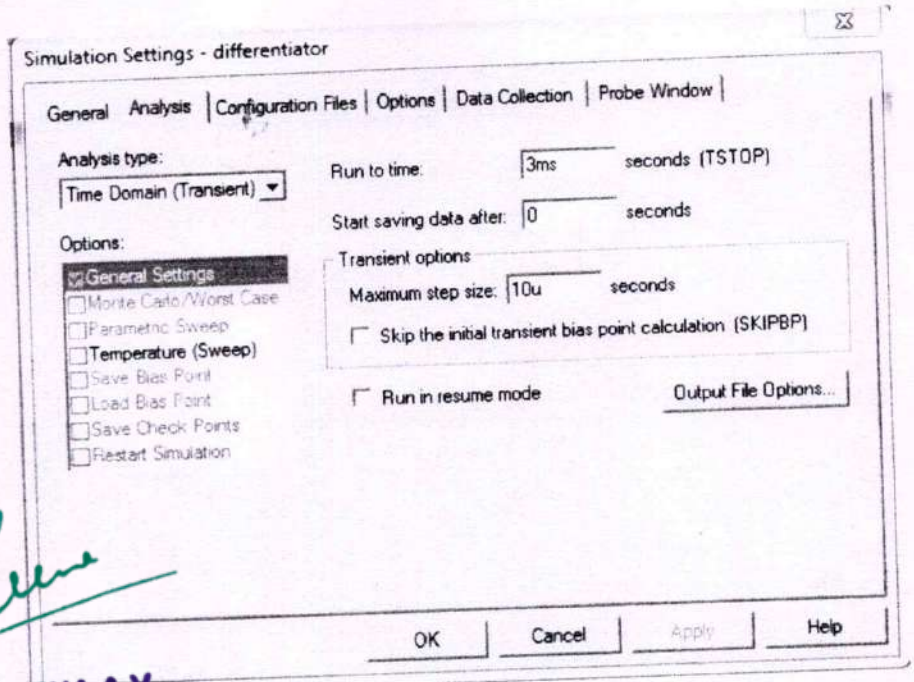
Teacher's Signature

RC DIFFERENTIATING AND INTEGRATING CIRCUITS

CIRCUIT DIAGRAM:



Profile Settings:



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RC DIFFERENTIATOR AND INTEGRATING CIRCUITS.

AIM: To verify and simulate input and output waveform of RC differentiator and Integrating circuits.

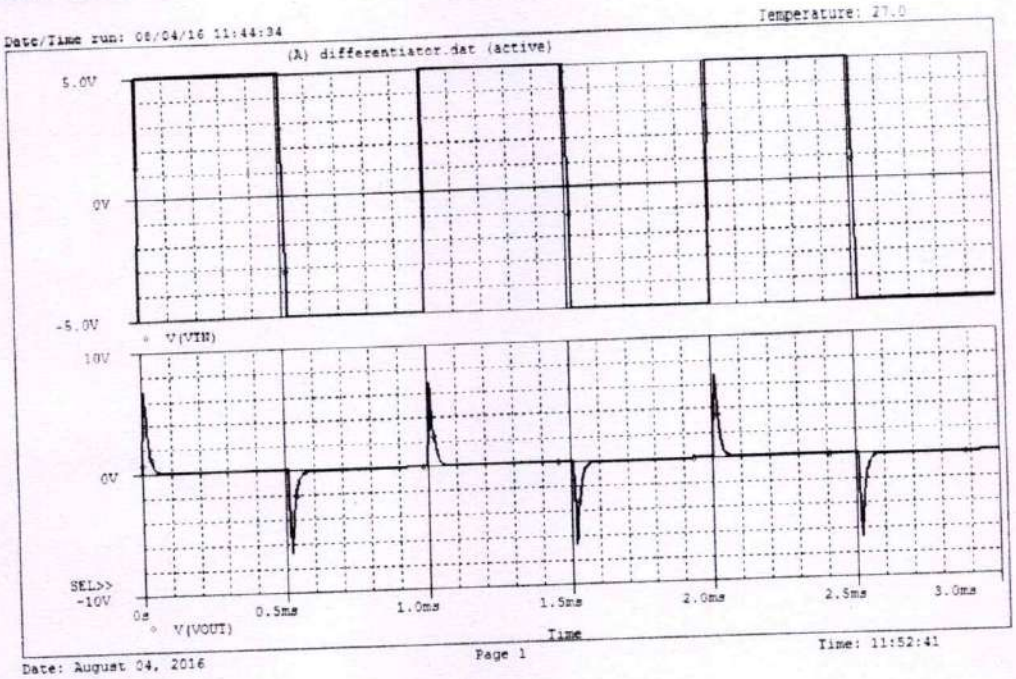
EQUIPMENTS REQUIRED:
PC installed with ORCAD simulation software.

PROCEDURE 1:-
1. Create a new project and a new schematic page.
2. Place the necessary circuit components and source. Select the circuit ground.
3. Set up the required analysis in the simulation setting window.
4. Under the Analysis type, select time domain sweep. Select general setting option. Set the run to time and maximum step size values. Then save the simulation profile.
5. After the parameter are set you can start simulation by selecting Run option.
6. The input and output waveform of circuit will be shown in the graph. Observe the graph.

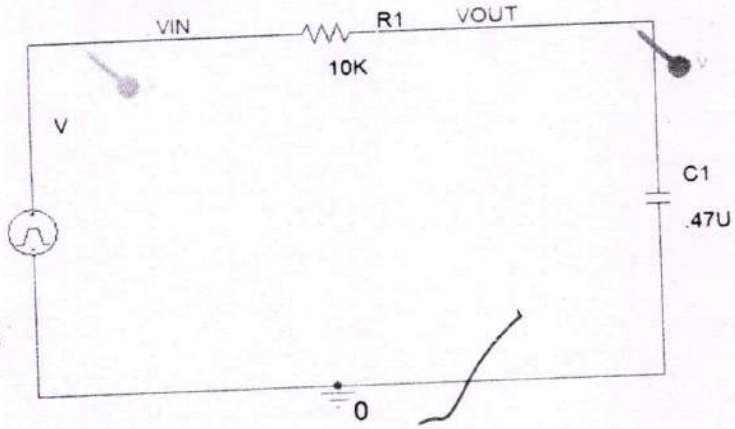
Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Observation:



CIRCUIT DIAGRAM:



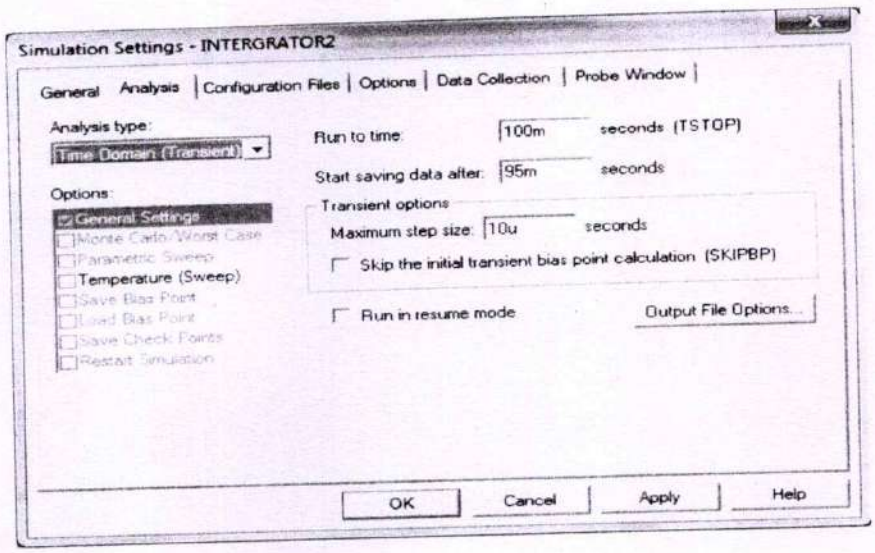
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROCEDURE 2:

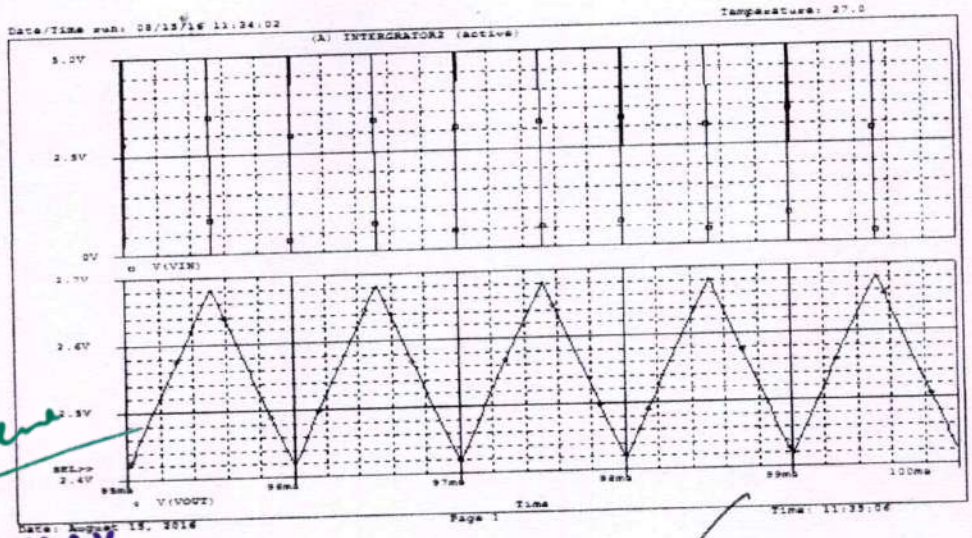
1. Create a new project and a new schematic page
2. Place the necessary circuit components and source. Select the circuit ground interconnect the components using wire.
3. Set up the required analysis in the simulation setting window
4. Under the analysis type select time domain (transient) sweep. Select General setting option. Set the run to time and maximum step size values. Then save the simulation profile.
5. After the parameter are set you can start simulation by Run option
6. The input and output waveform of circuit will be shown in the graph. Observe the graph

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Profile Settings:



Observation:



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

[redacted]

Experiment Name / No.:

Camlin Page No. 42
Date / /

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

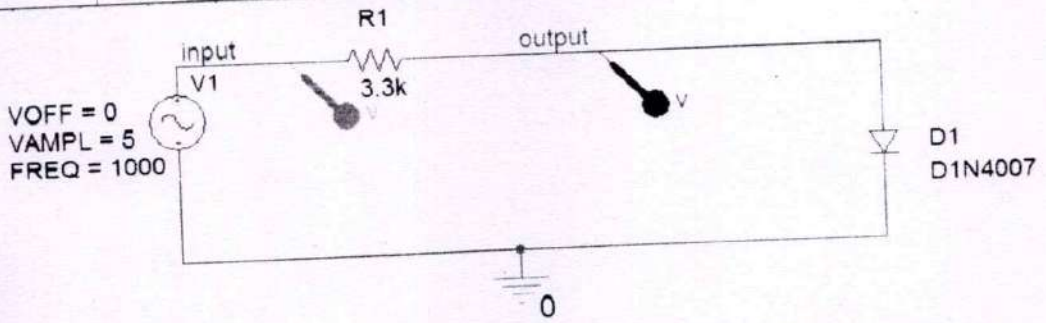
RESULT : Verified and obtained the output waveform of RC differentiator and Integrator circuit using PSPICE software.

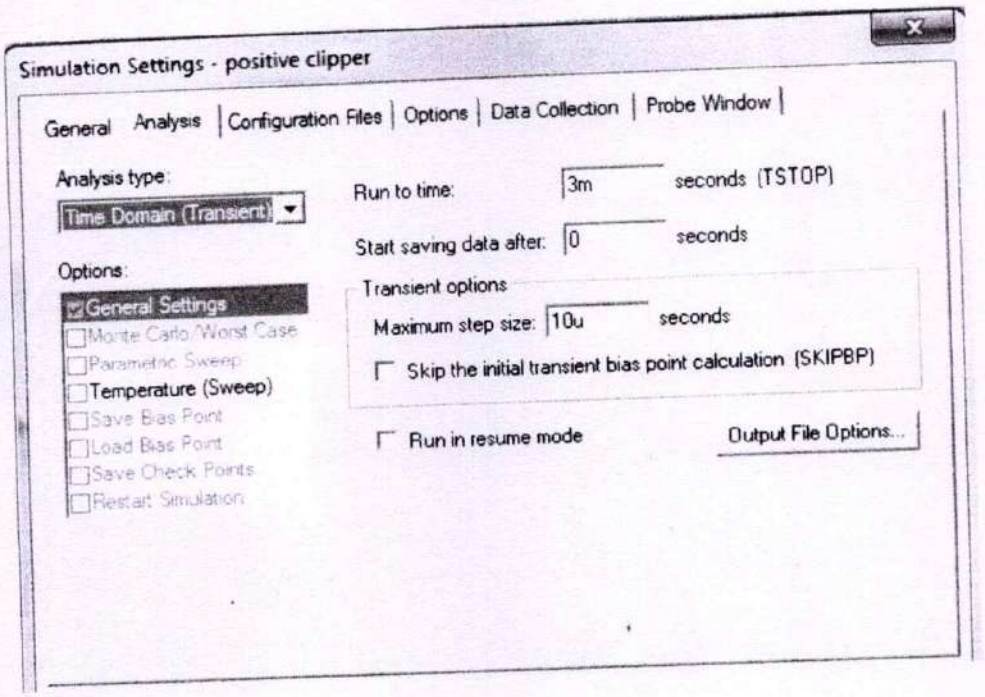
Procedure	5
Conduction	5
Result	5
Viva	9
Teacher's Signature	5

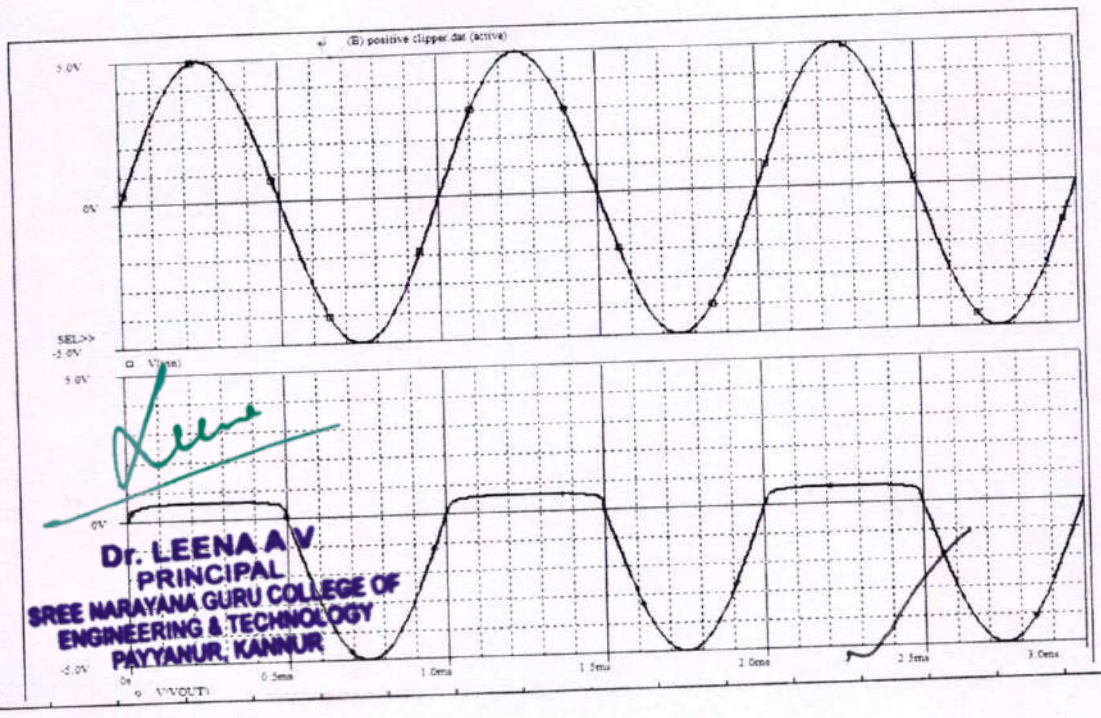
10/7/23

HOD ECE

positive clipper







Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

CLIPPING CIRCUITS

AIM:

To verify and simulate the input and output waveform of clipper circuit.

EQUIPMENTS REQUIRED:

PC installed with OREAD simulation software.

PROCEDURE:

1. Create a new project and a new schematic page

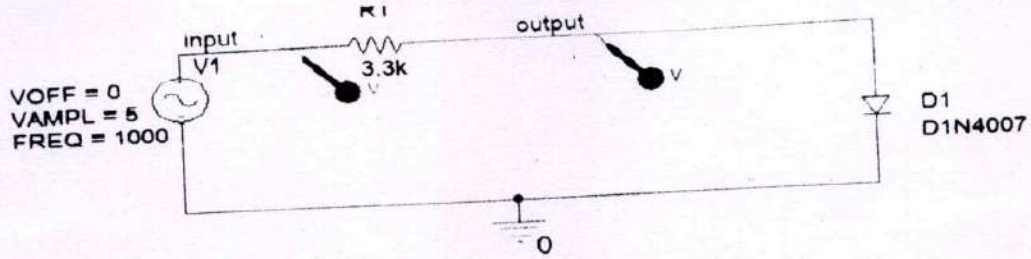
2. Place necessary circuit components and source selected the circuit ground interconnect the component using wire tool. After that place current probe at the resistor

3. Set up the required analysis in the simulation setting window

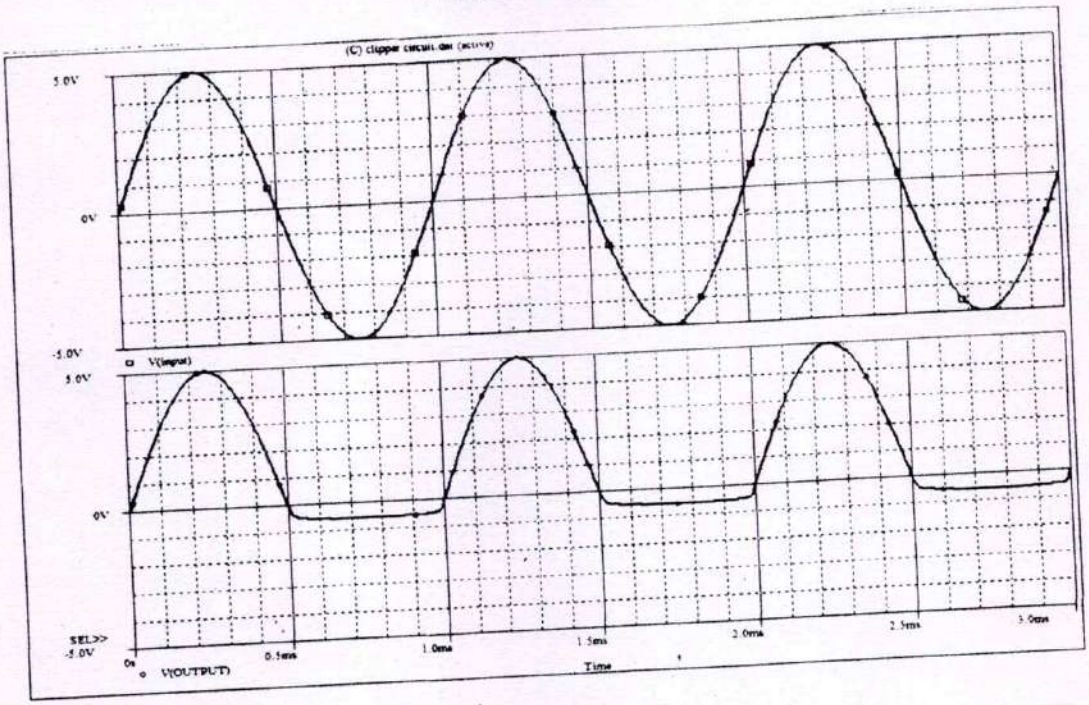
4. Under Analysis the time delay step select general setting option. Set the run to time and maximum step size values. Then click "Apply" and OK to save the simulator profile

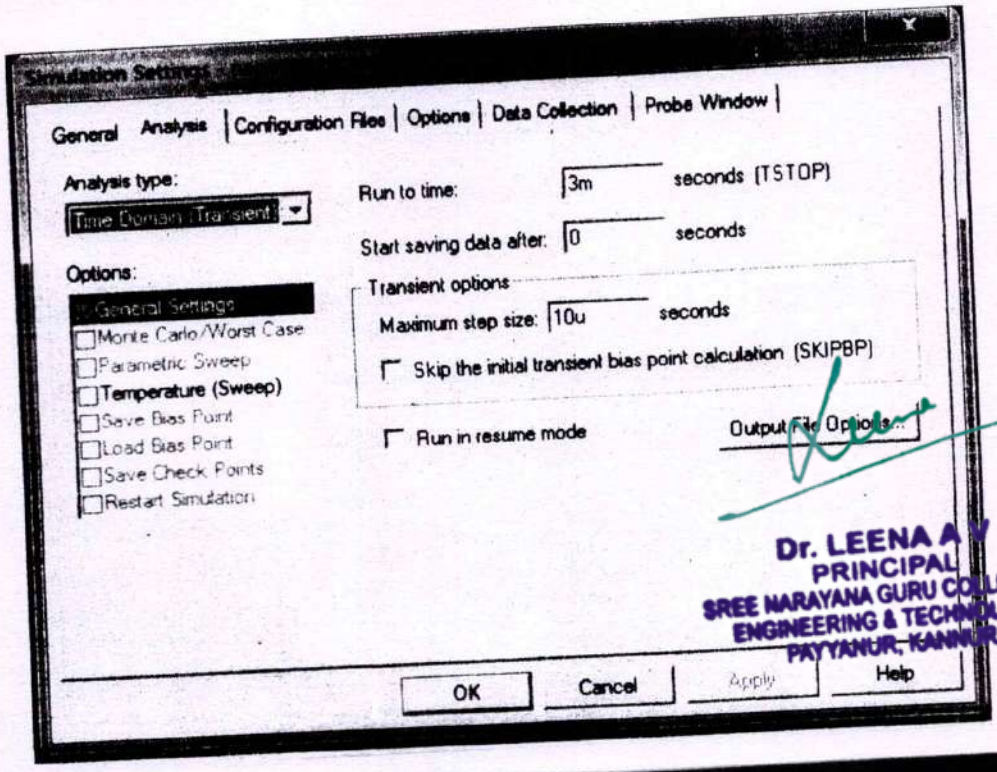
5. After the parameter are set you can start simulation by selecting run option

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR



Negative clipper





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.:

6. Input and output waveform will be shown in the graph. Observe the graph.

RESULT: Verified and obtained the output waveform of clipper circuit using PSPICE software.

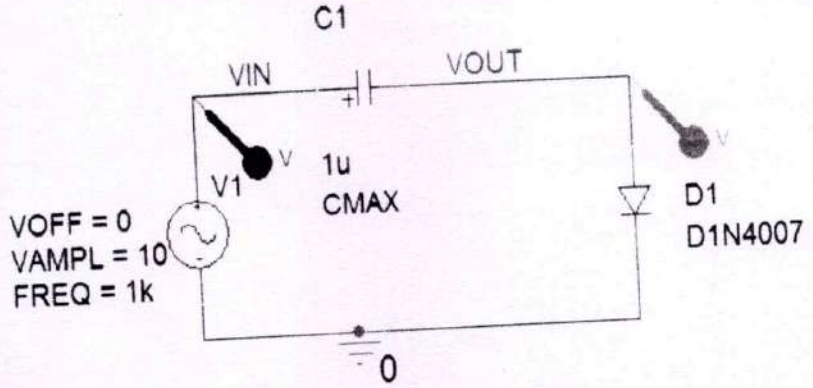
10/7/23

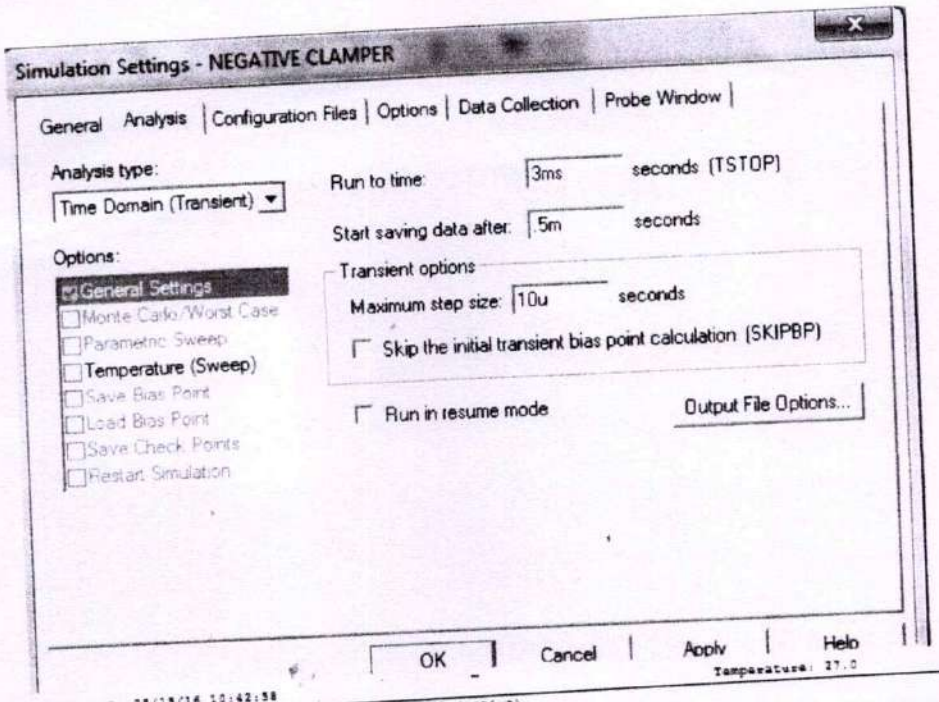
Procedure	5
Conduction	5
Result	5
Viva	8
Record	5

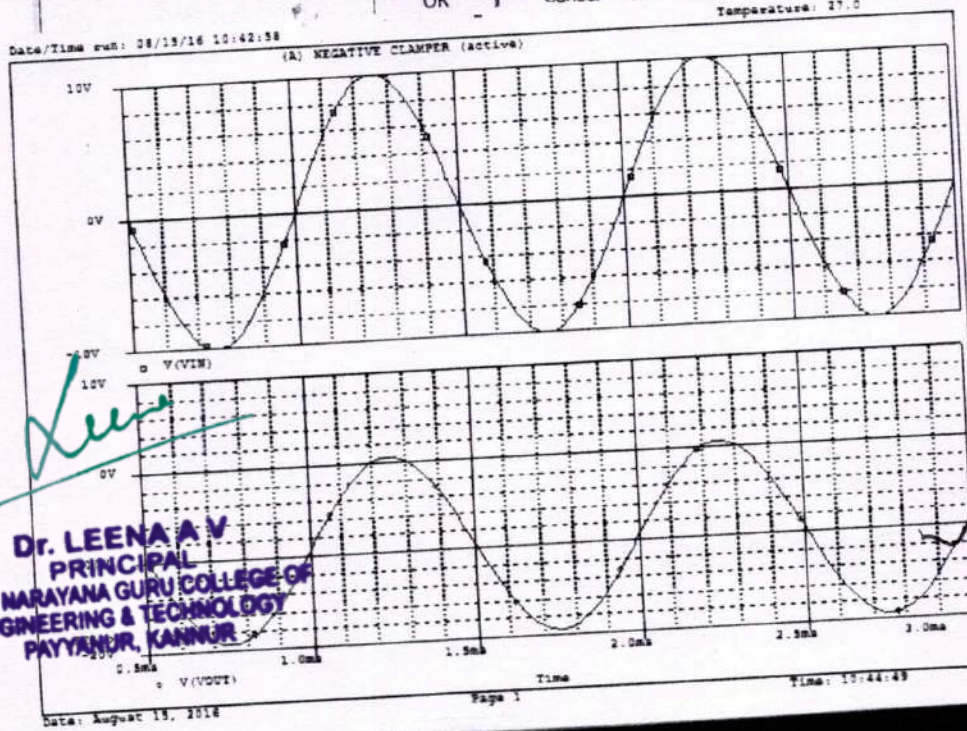
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD ECE

Teacher's Signature:







Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

[redacted]

Experiment Name / No.:

6) Input and output waveform will be shown in the graph. Observe the graph.

RESULT: Verified the input and output waveform of both positive and negative clamper using PSPICE software.

20/2/23

Procedure	5
Conduction	5
Result	5
Viva	8
Record	5

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD ECE

Teacher's Signature:

Simulation Settings - rc freq

General | Analysis | Configuration Files | Options | Data Collection | Probe Window

Analysis type:

AC Sweep/Noise

Options:

- [x] General Settings
- [ ] Monte Carlo/Worst Case
- [ ] Parametric Sweep.
- [ ] Temperature (Sweep)
- [ ] Save Bias Point
- [ ] Load Bias Point

AC Sweep Type

- ( ) Linear
- (•) Logarithmic

Decade

Start Frequency: 10

End Frequency: 4e9

Points/Decade: 10

Noise Analysis

- [ ] Enabled

Output Voltage

I/V Source

Interval

Output File Options

- [ ] Include detailed bias point information for nonlinear controlled sources and semiconductors (.OP)

OK | Cancel | Help

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

[redacted]

Experiment Name / No.:

Camlin Page No. 48
Date / /

RESULT: Frequency response of RC coupled amplifier was simulated using simulation software.

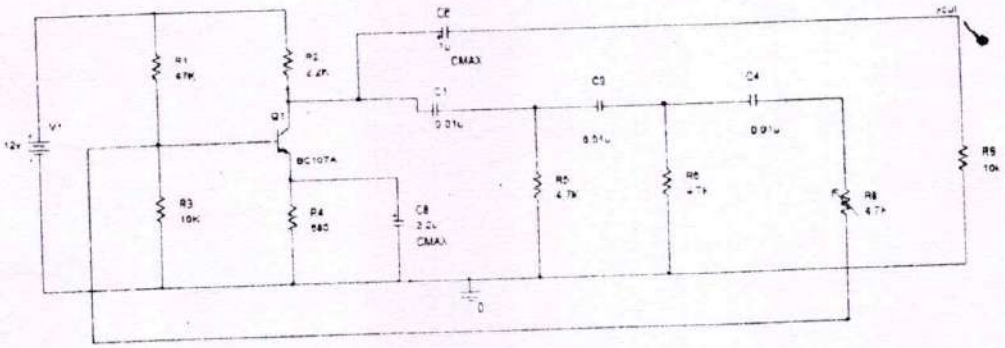
Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

10/7/23

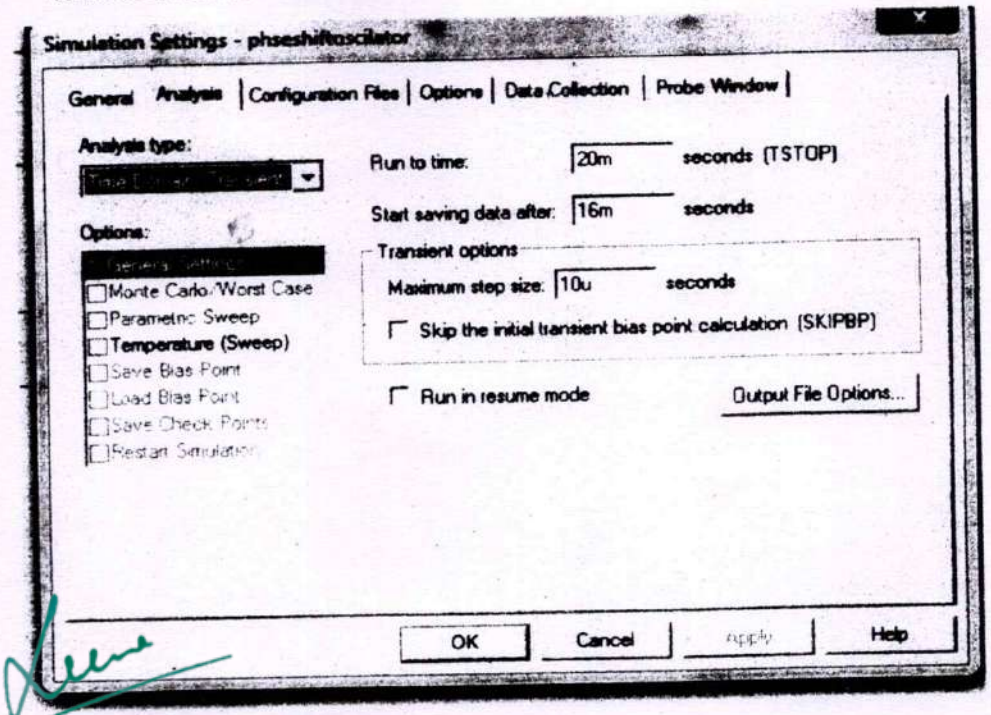
HOD ECE

Procedure	5
Conduction	5
Result	5
Viva	8
Teacher's Signature:	5

CIRCUIT DIAGRAM



SIMULATION PROFILE



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RC PHASE SHIFT OSCILLATOR

AIM:

To verify and simulate the RC phase shift oscillator.

EQUIPMENT REQUIRED:

PC installed with ORCAD simulation software

PROCEDURE:

1. Create a new project and a new schematic page for both circuits.

2. Place the circuit components and source select the circuit ground. interconnect using wire tool.

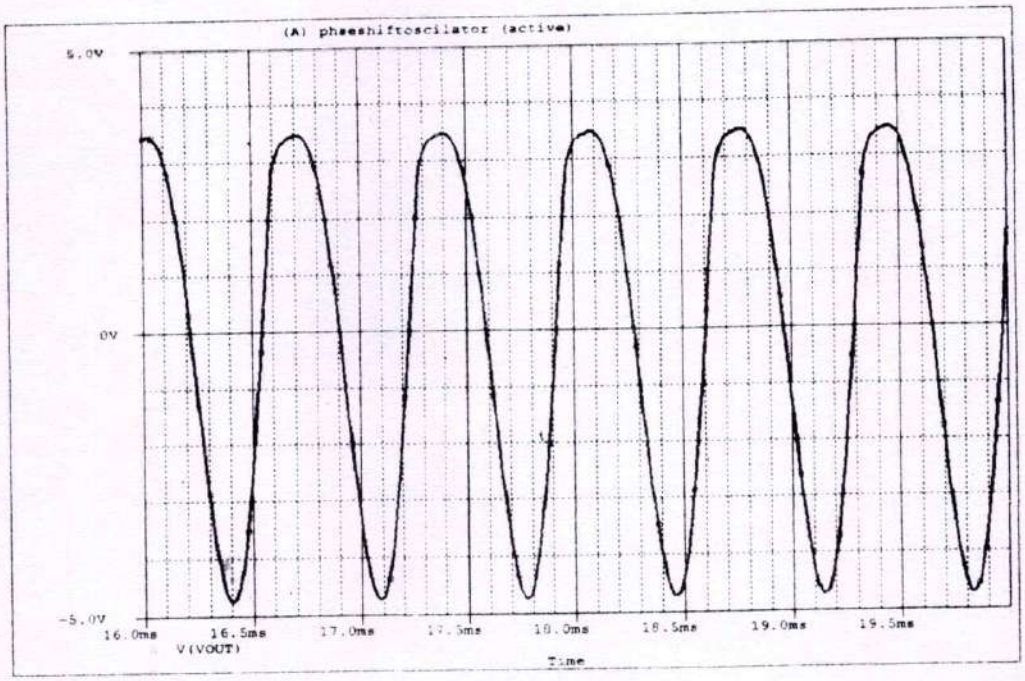
3. Setup the required analyses in the simulation setting window.

4. Under Analysis type, Time domain sweep - select general setting option

5. Set the sum to time and maximum step size values. Then save the simulation profile.

6. After the parameter are set you can run simulation by selecting Run option.

OUTPUT



RESULT: RC Phase Shift Oscillator was simulated using PSPICE simulation software.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.:

7. Output waveform will be shown in the graph observe the graph.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

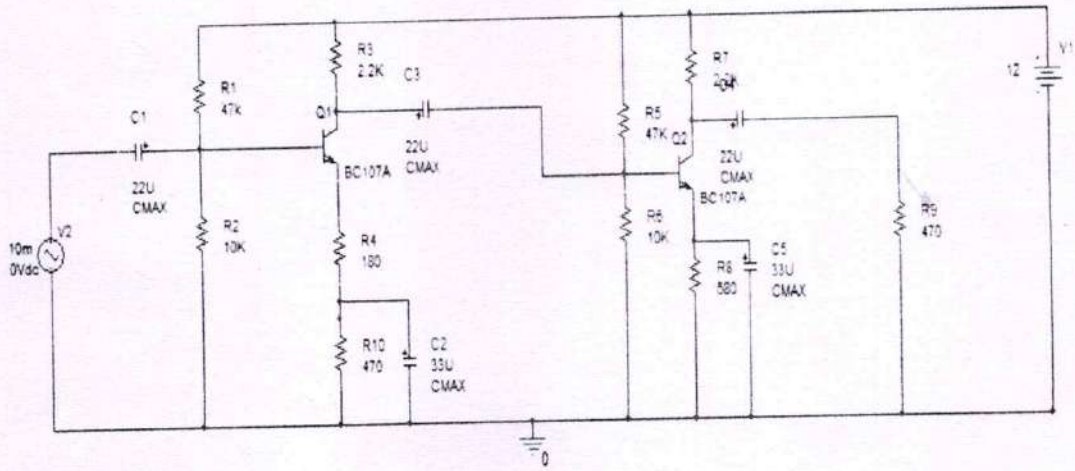
RESULT: Re phase shift oscillator was simulated using Spice simulation software

10/7/23

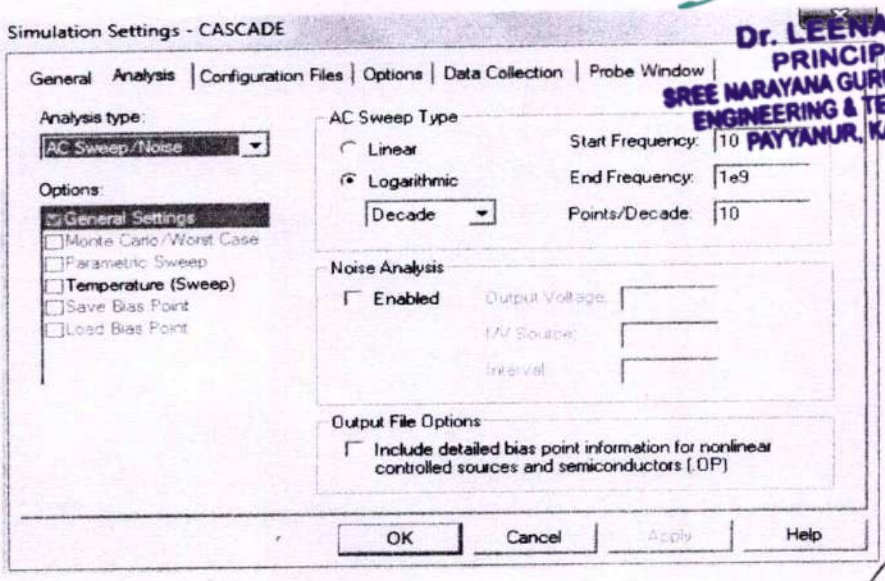
HOD ECE

Procedure	5
Conduction	5
Result	5
Viva	9
Teacher's Signature Record	5

CIRCUIT DIAGRAM



SIMULATION RESULTS



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

CASCADE AMPLIFIER

AIM:

To verify and simulate the input and output waveform of positive and negative clamper circuits.

EQUIPMENT REQUIRED:

PC installed with ORCAD Simulation software.

PROCEDURE:

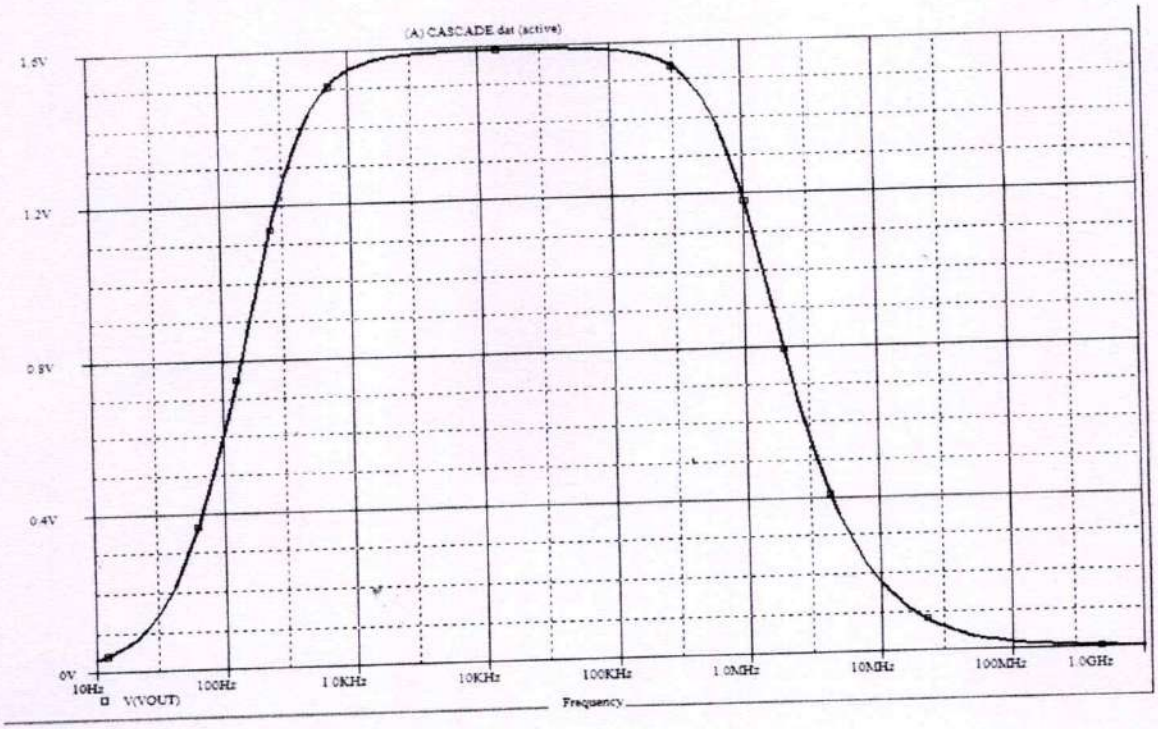
1. Create a new project and a new schematic page.

2. Place necessary circuit components and some select the circuit ground. Interconnect the components using wire tool.

3. Set up required analysis in the simulation setting window.

4. Under Analysis type select a sweep enter necessary parameter value for logarithmic sweep. Then click "Apply" to save the simulation profile.

5. After the parameter are set you can start simulation by selecting Run option.



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

[redacted]

6. Input and Output waveform will be shown on the graph. Observe the graph.

Procedure	5
Conduction	5
Result	5
Viva	9
Record	5

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

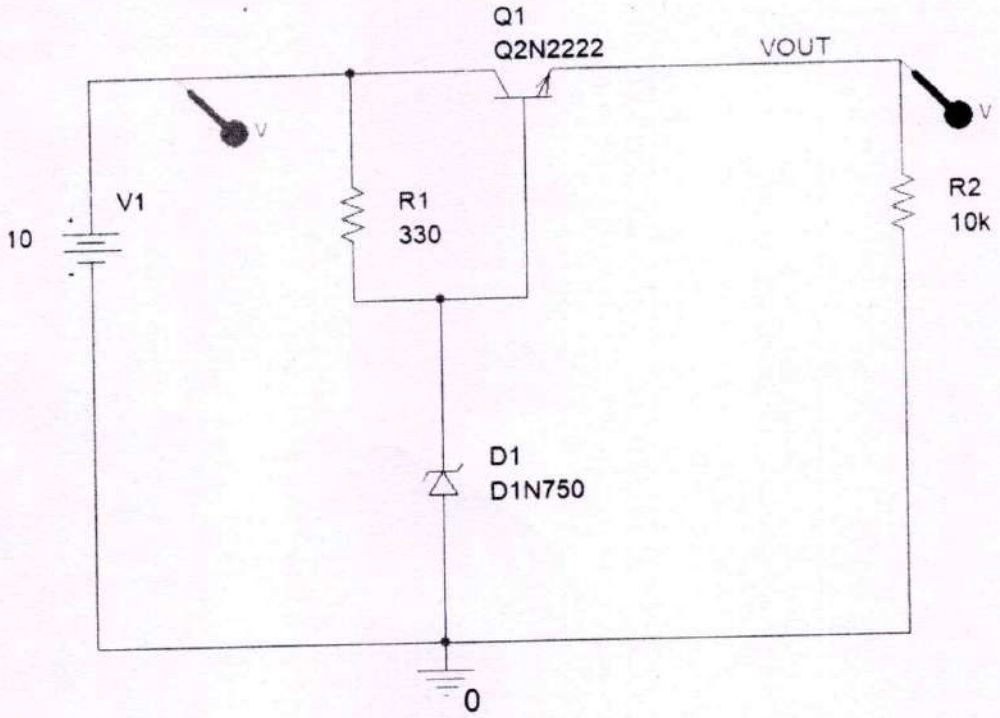
RESULT:

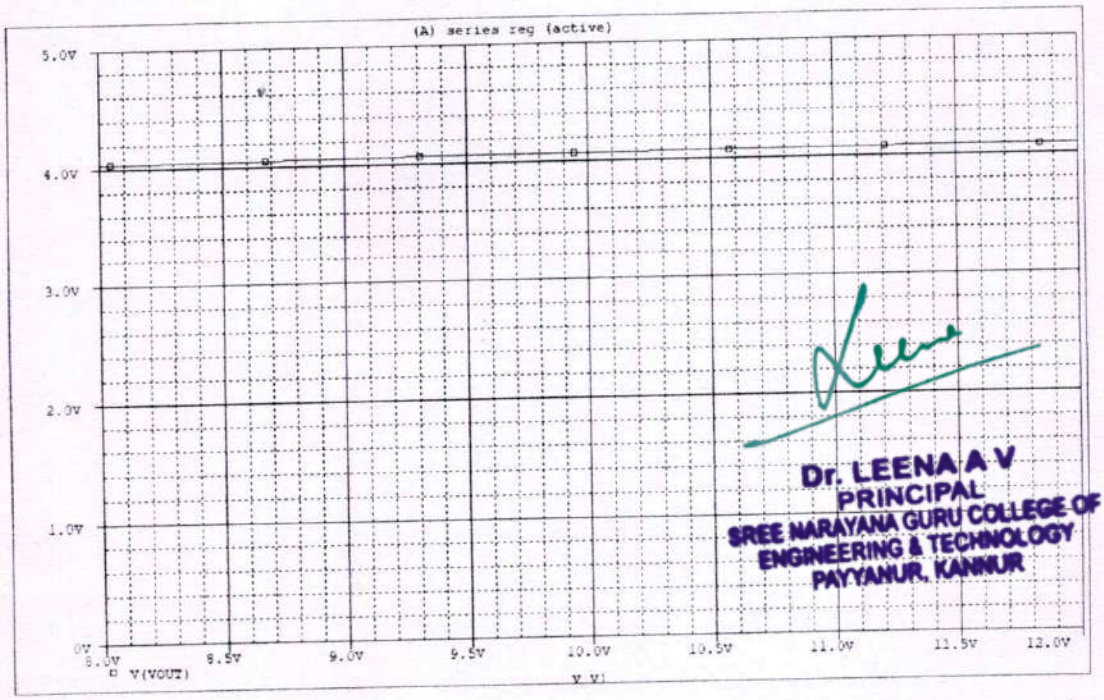
Frequency response of Cascade Amplifier was simulated using Pspice software.

HOD ECE

Teacher's Signature:

LINE REGULATION





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.: 6

SERIES VOLTAGE REGULATOR

AIM:

To verify and simulate a series voltage regulator - line and load characteristics.

EQUIPMENT REQUIRED:-

PC installed ORCAD simulation software.

PROCEDURE:

1. Create a new project and a new schematic page.

2. place necessary circuit components and source. Select the circuit ground. Interconnect the components using wire tool.

3. Set up the required analysis in the simulation setting window.

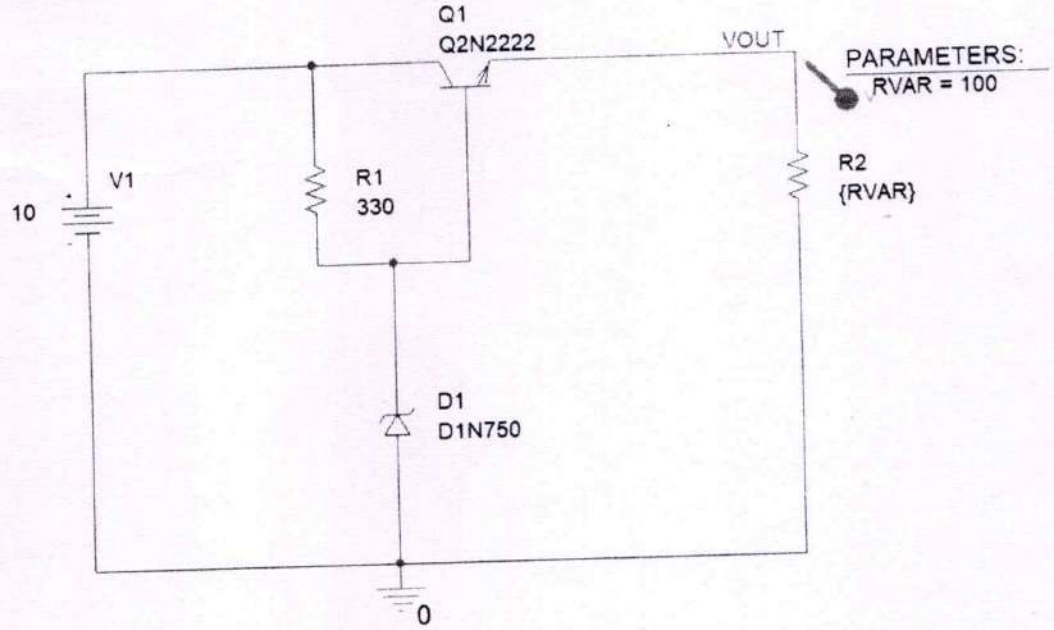
4. Under Analysis type, select DC sweep. Enter necessary parameter values (start, end and increment values for linear sweep type). Then click "Apply" & save the simulation profile.

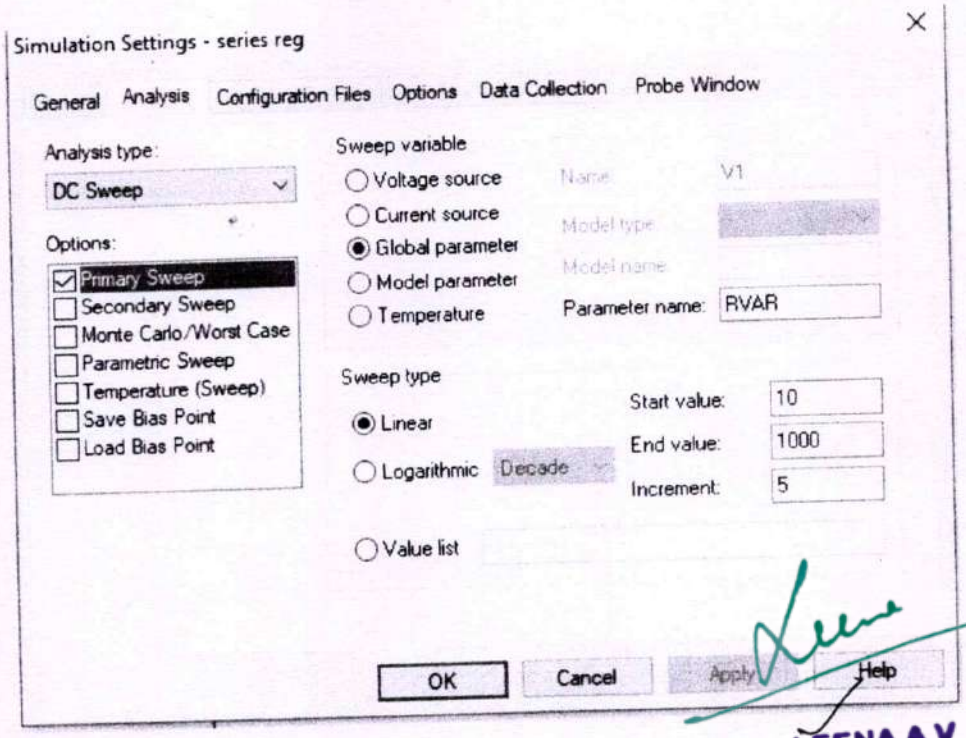
5. After the parameter are set you can run a simulation by selecting Run option

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:

VOLTAGE LOAD REGULATOR





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.:

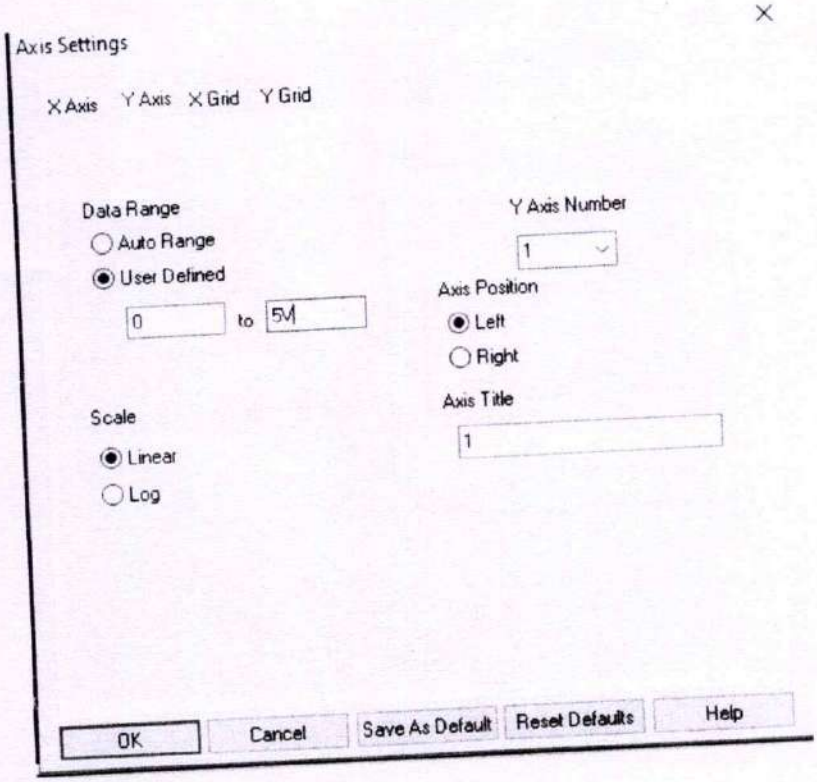
5. Enter necessary parameter values. Then click "Apply" to save the simulation profile

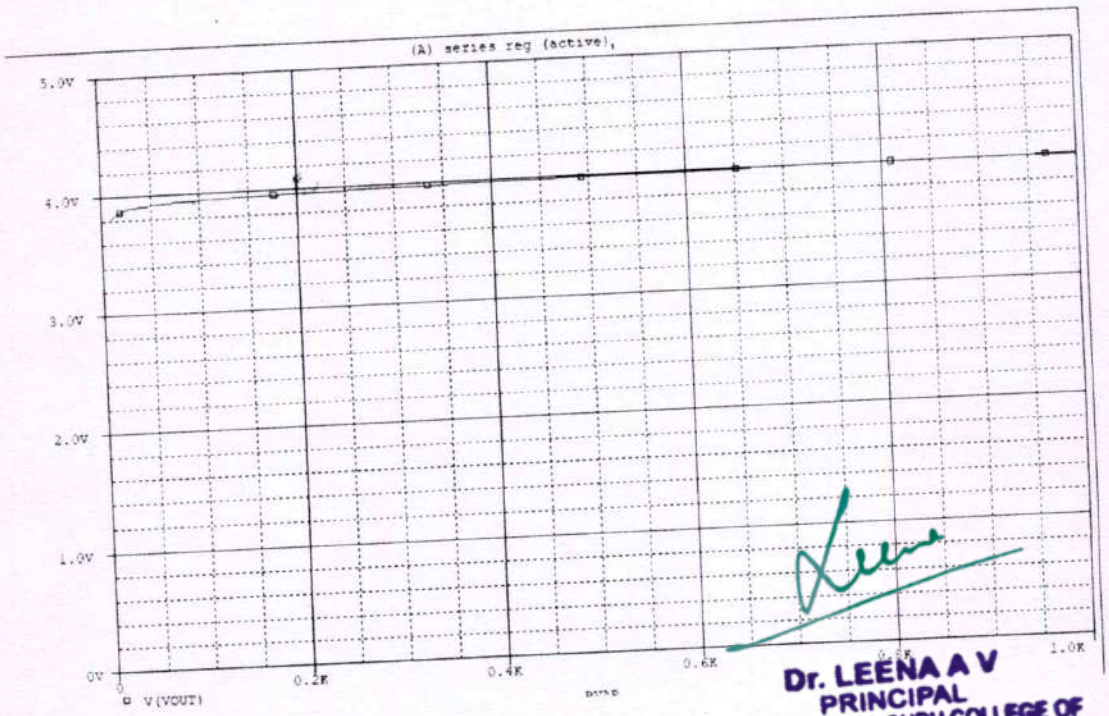
6. After the parameter are set, you can start a simulation by selecting Run option.

7. Waveform will be shown in the graph observe the graph.

8. On the output waveform click the option plot → Axis setting → Y axis → user defined (select the data range 0 to 5V)

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR





Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Experiment Name / No.:

Camlin Page No. 56
Date / /

RESULT: Verified And simulated series voltage regulator using PSPICE Software.

10/7/20

Procedure	5
Conduction	5
Result	5
Viva	9
Record	5

HOD ECE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:

Completed all experiments

Certify and Verify By

10/7/23

Thrishna. S
Assistant Professor
[illegible] ECE
SNGCET, Payyanur

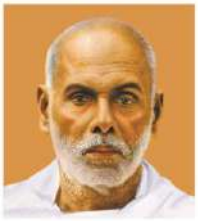
Dr. LEENA. A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Est. 2003

Sree Narayana Guru College of Engineering & Technology

CHALAKKODE P.O., KOROM, PAYYANUR, KANNUR-670 307



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SREE NARAYANA GURU
COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR – 670 307

Sree Narayana Guru College of Engineering and Technology

CERTIFICATE

Name...HRUDHUL RAGH.....

Semester.....S5..... Branch. ...EEE.....

Roll No.....3.....Uni. Reg. No.....

Certified that this is a Bonafide Record of the work done in the ..EEL 331 MICROPROCESSORS

MICRO CONTROLLERS LAB *of Sree Narayana Guru College of Engineering & Technology, Payyanur by*

Mr. / ~~Miss.~~ HRUDHUL RAGH.....

Place : Payyanur

Date : 03/02/2023

Staff Member Incharge

Internal Examiner

16/02/23

Vaisbakh. M. Nair
AP, EEE SNGCET

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY, PAYYANUR
KASARAGOD

External Examiner

16/02/23

SUJITH D K
AP, EE, CETKR

INDEX

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

HOD EEE

PROGRAM :
(ADDITION)

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	3A 00 42		LDA 4200 H	Get 1st data in A and save in B
4103	47		MOV B, A	
4104	3A 01 42		LDA, 4201 H	Get 2nd data in A register.
4107	0E 00		MVI , C, 00H	Clear C register to account for carry
4109	80		ADD B	Get the sum in A register.
410A	D2 0E 41		JNC AHEAD	if CF=0, go to AHEAD
410D	0C		INR C	if CF=1, increment C-register.
410E	32 02 42	AHEAD	STA 4202H	Store the sum in memory.
4111	79		MOV A, C	
4112	32 03 42		STA 4203H	Store the carry in memory
4115	76		HLT	Halt program Execution

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 01

19/09/22 ARITHMETICS OPERATIONS USING 8085 MICROPROCESSOR [8-BIT] 01

AIM :

i) Write an assembly language program to add two numbers of 8 bit data stored in memory locations 4200_H and 4201_H and store the result in 4202_H and 4203_H

ii) Write an assembly language program to subtract two numbers of 8-bit data stored in memory 4200_H and 4201_H. Store the magnitude of results in 4202_H. If the result is positive store 00 in 4203_H or if the result is negative store 01 in 4203_H

iii) Write an assembly language program to multiply two numbers of 8 bit data stored in memory 4200_H and 4201_H and store the product in 4202_H and 4203_H

iv) Write an assembly language program to divide two numbers of 8 bit data stored in memory locations 4200_H and 4201_H Store the quotient in 4202_H and the reminder in 4203_H

Algorithm (Addition)

1. Load the first data from memory to accumulator and move it to B register.
2. Load the second data from memory to accumulator.
3. Clear C register.
4. Add the content of B register to accumulator
5. Check the carry. If carry = 1, go to step 6 or if carry = 0, go to step 7
6. Increment the C-register.

PROGRAM

SUBTRACTION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	3A 01 42		LDA 4201 H	
4103	47		MOV B,A	Get the subtracted in B-register.
4104	3A 00 42		LDA 4200H	Get the minuend in A register.
4107	0E 00		MVI C, 00H	Clear the C register to account for sign
4109	90		SUB B	Get the difference in A register
410A	02 11 41		JNC AHEAD	If CF=0, then go to AHEAD.
410D	0C		INR C	If CF=1 then increment C register
410E	2F		CMA	Get 2's complement of difference
410F	C6 01		ADI 01H	(result) in A register
4111	32 02 42	AHEAD	STA 4202 H	Store the result in memory
4114	79		MOV A,C	
4115	32 03 42		STA 4203 H	Store the sign bit in memory
4118	76		HLT	Halt program execution

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

7. Store the sum in memory
8. Move the carry to accumulator and store in memory.
9. Stop.

Algorithm (Subtraction)

1. Load the subtrahend (data to be subtracted) from memory to accumulator and move it to B-register.
2. Load the minuend from memory to accumulator.
3. Clear C register to account for sign of the result.
4. Subtract the content of B register (subtrahend) from the content of accumulator (minuend).
5. Checks for carry. If carry=1, go to step 6 or if carry=0, go to step 7.
6. Increment C register. Complement the accumulator and add 1 to it
7. Store the difference (accumulator) in memory.
8. Move the content of C-register (sign bit) to accumulator and store in memory.
9. Stop.

Algorithm (Multiplication)

1. Load the address of the first data in HL pair (pointer)
2. Clear C-register for overflow (carry).
3. Clear the accumulator.
4. Move the first data to B register [Count].
5. Increment the pointer.
6. Move the second data to D-register (multiplicand)
7. Add the content of D-register to accumulator.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM

MULTIPLICATION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	21 00 42		LXI H, 4200H	Specify program starting address
4103	0E 00		MVI C, 00H	Clear C to account for overflow (carry)
4105	AF		XRA A	Clear Accumulator
4106	46		MOV B, M	Get 1st data in B register
4107	23		INX H	
4108	56		MOV, D, M	Get second data in D register
4109	82	REPT:	ADD D	ADD D register to accumulator
410A	D2 0E 41		JNC AHEAD	
410D	0C		INR C	If CF=1, increment C register
410E	05	AHEAD:	DCR B	
410F	C2 09 41		JNZ REPT	Repeat addition until ZF=1
4112	23		INX H	
4113	77		MOV M, A	Store low byte of product in memory.
4114	23		INX H	
4115	71		MOV M, C	Store high byte of product in memory
4116	76		HLT	Stop Program Execution

8. Check the carry. If carry = 1, go to step 9 or if carry = 0, go to step 10
9. Increment C register
10. Decrement B-register (count).
11. Check whether count has reached zero. If ZF = 0 repeat steps 7 through 11, or if ZF = 1 go to next step.
12. Increment the pointer and store low byte of the product in memory.
13. Increment the pointer and store high byte of the product in memory.
14. Stop.

Algorithm (Division)

1. Load the divisor in accumulator and move it to B register
2. Load the Dividend in accumulator.
3. Clear C-register to account for quotient.
4. Check whether divisor is less than dividend. If divisor is less than dividend, go to step 8, otherwise go to next step.
5. Subtract the content of B register from accumulator.
6. Increment the content of C register (quotient)
7. Go to step 4.
8. Store the content of accumulator (remainder) in memory.
9. Move the content of C register (quotient) to accumulator and store in memory
10. Stop.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM

DIVISION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	3A 01 42		LDA 4201H	
4103	47		MOV B,A	Get the divisor in B register
4104	3A 00 42		LDA 4200H	Get the dividend in A register
4107	0E 00		MVI C,00H	Clear C register for quotient
4109	B8	AGAIN	CMP B	
410A	DA 12 41		JC STORE	If divisor is less than dividend go to store
410D	90		SUB B	Subtract divisor from dividend.
410E	0C		INR C	Increment quotient by one for each subtraction
410F	C3 09 41		JMP AGAIN	
4112	32 03 42	STORE	STA 4203H	Store the remainder in memory
4115	79		MOV A,C	
4116	32 02 42		STA 4202H	Store the quotient in memory.
4119	76		HLT	Halt program execution

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

	Memory Address	Content
For Addition ;	4200	E2
	4201	45
	4202	27
	4203	01
For Subtraction ;	4200	5E
	4201	34
	4202	2A
	4203	00
For Multiplication ;	4200	C7
	4201	4A
	4202	86
	4203	39
For Division ;	4200	C9
	4201	0A
	4202	14
	4203	01

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RESULT :

Performed arithmetic operations in 8085 μp and output is verified.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HODEEE

PROGRAM

ADDITION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	2A 00 42		LHLD 4200H	Get the 1st data in HL pair
4103	EB		XCHG	Save 1st data in DE pair
4104	2A 02 42		LHLD 4202H	Get 2nd data in HL pair
4107	AF		XRA A	Clear A register to carry
4108	19		DAD . D	Get the sum in HL pair
4109	02 0D 41		JNC AHEAD	If CF=0 go to AHEAD
410C	3C		INR A	If CF=1 increment A-register
410D	22 04 42	AHEAD	SHLD 4202H	Store the sum in memory
4110	32 06 42		STA 4206H	Store the carry in memory
4113	76		HLT	Halt program execution

Memory address.	Content
4200	54
4201	C2
4201	92
4203	8A

Memory address	Content
4204	EG
4205	4C
4206	01

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 2

26/09/22 ARITHMETIC OPERATIONS USING 8085 MICROPROCESSOR [16 - BIT]. 06

AIM :

To write a assembly language programme (ALP) for performing arithmetic operations such as

(i) Addition

(ii) Subtraction

(iii) Division

using 8085 microprocessor

Algorithm

1.) Start the program

2) Load the two inputs into the memory

3) Perform Addition, Subtraction and Multiplication

4) Stop the Program

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM

SUBTRACTION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	3A 02 42		LDA 4202H	
4203	47		MOV B,A	Get low byte submitted in B register
4104	3A 00 42		LDA 4200H	Get low byte of minuend in A register
4107	90		SUB B	Get difference of low byte in A register
410B	32 04 42		STA 4204H	Store the result in memory
410B	3A 03 42		LDA 4203H	
410E	47		MOV B,A	Get high byte of subtrahend in B register
410F	3A 01 42		LDA 4201H	Get high byte of minuend in A register
4112	98		SBB B	Get difference of high bytes in A-register
4113	32 05 42		STA 4205	Store the result
4116	76		HLT	Halt program execution

Memory Address	Content
4200	A8
4201	B2
4202	2C
4203	92
4204	7F
205	20

Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM

MULTIPLICATION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100			LHLD 4200H	Get 1st data in HL pair
4103			SPHL	Save the 1st data in SP
4104			LHLD 4202	Get 2nd data in HL pair
4107			XCHG	Save 2nd data in DE pair
4108			LXI H,0000H	Clear HL pair
410B			LXI B,000H	Clear BC pair account overflow
410E		NEXT	DAD SP	Add the content of SP
410F				to sum.
410F			JNC AHEAD	
4102			INX B	IF CF = 1, increment BC pair
4113		AHEAD	DCX D	
4114			MOV A,E	Check for zero in DE pair This is done by logically
4115			ORA D	ORing D and E
4116			JNZ NEXT	Repeat ADDITION until count is zero.
4119			SHLD 4204H	Store lower 16 bit of product in memory
411C			MOV L,C	
411D			MOV H,B	
411E			SHLD 4206	Store the 16 bit of product in memory
4121			HLT	Halt program execution

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Memory Address	Content
4200	24
4201	5A
4201	C2
4203	47

Memory Address	Content
4204	48
4205	4B
4206	44
4207	19

RESULT :

Obtained assembly language programs to perform the addition, subtraction and multiplication of 16 Bit data

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM [Search for smallest data in a array]

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	21 00 42		LXI H, 4200H	Set pointer for array
4103	46		MOV B, M	Set count for no. elements in array
4104	23		INX H	
4105	7E		MOV A, M	Set list element of array as smallest data
4106	05		DCR B	Decrement the count.
4107	23	LOOP	INX H	
4108	BE		CMP M	Compare an element of array with current smallest data
4109	DA 0D41		JC AHEAD	If CF=1 go to AHEAD
410C	7E		MOV A, M	If CF=0 then content of memory is smaller than A. Hence if CF=0, make memory as smallest by moving to A
410D	05	AHEAD	DCR B	
410E	C2 07 41		JNZ LOOP	Repeat comparision until count is zero
4111	32 00 43		STA 4300H	Store the smallest data in memory.
4114	76		HLT	Halt program execution

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 3

10/10/22

SEARCH FOR SMALLEST AND LARGEST DATA IN A ARRAY

09

AIM :

Write an assembly language program to search the smallest/Largest data in an array of N data stored in memory from 4200H to (4200H + N) The first element of the array gives the number of data in the array Store the smalles / largest data in 4300H.

Algorithm

1) Start the program
2) Load the two inputs into the memory
3) Perform the seas.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM [Search for Largest data in a array]

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENT
4100	21 00 42		LXI H,4200H	Set pointer for array
4103	46		MOV B, M	Set count for number of elements in array
4104	23		INX H	
4105	7E		MOV A,M	Set 1st element of array as largest data
4106	05		DCR B	Decrement the count
4107	23	LOOP	INX H	
4108	BE		CMP M	Compare an element of array with current largest data.
4109	D2 0D 41		JNC AHEAD	IF CF=0, go to AHEAD
410C	TE		MOV A, M	IF CF=1 then count of memory is larger than accumulator. Hence if CF=1 make memory content as current largest by moving it to A register
410D	05	AHEAD	DCR B	
410E	C2 07 41		JNZ LOOP	Repeat comparision until count is zero
4111	32 00 43		STA 4300H	Store the largest data in memory.
4114	76		HLT	Halt the program execution

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

OBSERVATIONS

	Memory address	
	4200	07
	4201	42
	4202	3A
Array	4203	1C
	4204	24
	4205	B4
	4206	25
	4207	4F
Smallest data	4300	1C
Count	4200	07
	4201	62
Array	4202	7D
	4203	FC
	4204	24
	4205	C2
	4206	0F
	4207	92
Largest data	4300	FC

RESULT:

Obtained the ALP to search the smallest / Largest data in array.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM [To sort an array of data in Ascending Order]

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENT
4100	3A 00 42		LDA 4200H	Load the count value in A-register
4103	47		MOV B, A	Set count for N-1 repetitions
4104	05		DCR B	of N-1 comparisons
4105	21 00 42	LOOP 2	LXI H, 4200H	Set pointer for array
4108	4E		MOV C, M	Set count for N-1 comparisons.
4109	0D		DCR C	
410A	23		INX H	Increment pointer
410B	7E	LOOP 1	MOV A, M	Get one data of array in A
410C	23		INX H	
410D	BE		CMP M	Compare next data with A register.
410E	DA 16 41		JC AHEAD	If the content of A is less greater ~~to~~ ~~w~~ many go to AHEAD.
411	56		MOV D, M	If the content of A is greater than.
			MOV M, A	The content of memory then
			DCX M, A	exchange the content of memory
			MOV M, D	Pointed by HL and pre-location
			INX H	
			DCR C	
			JNZ LOOP1	Repeat CMP until Ccount is zero
			DCR B	
			JNZ LOOP 2	Rep CMP(N-1) until B count is zero

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 4

17/10/22

SORTING AN ARRAY IN ASCENDING ORDER

AIM:

Write an assembly language program to sort an array of data in the ascending order. The array is stored in the memory starting from 4200H. The first element of the array gives the count value for the number of elements in the array

Algorithm

1. Load the count value from memory to A register and save it in B register.
2. Decrement B-register (B is counter for N-1 repetitions)
3. Set HL pair as data array address pointer.
4. Set C register as counter for N-1 comparisons.
5. Load a data of the array in accumulator using the data address pointer.
6. Increment the HL pair (data address pointer)
7. Compare the data pointed by HL with accumulator
8. If carry flag is set (if the content of accumulator is smaller than memory) then go to step 10, otherwise go to next step.
9. Exchange the content of memory pointed by HL and the accumulator.
10. Decrement C register. If zeroflag is reset go to step 6 otherwise go to next step
11. Decrement B register. If zero flag is reset go the step 3 otherwise go to next step.
12. Stop.

411E	76		HLT	Halt program execution

OBSERVATION

	INPUT	OUTPUT
Memory Address	Content	Content
4200	07	07
4201	AB	34
4202	92	4F
4203	84	69
4204	4F	84
4205	69	92
4206	F2	AB
4207	34	F2

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RESULT

Obtained the assembly langauge program to sort an array of data in ascending order

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HODEEE

PROGRAM

Program to Convert 2 digit BCD to Binary Numbers

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENT
4100	3A 00 42		LDA 4200H	Get the data in A register
4103	5F		MOV E, A	and save in E-register
4104	E6 F0		ANI F0H	Mask the lower nibble
4106	07		RLC	Rotate the upper nibble
4107	07		RLC	to lower nibble position
4108	07		RLC	and save in B.
4109	07		RLC	
410A	47		MOV B, A	
410B	AF		XRA A	Clear accumulator
410C	0E 0A		MVI C, 0AH	Multiply tens digit by 0AH &
410E	80	REPT	ADD B	get the product in A-register
410F	0D		DCR C	
4110	C2 0E 41		JNZ REP	
4113	47		MOV B, A	Save the product in B register
4114	7B		MOV A, E	Get the BCD data in A register
4115	E6 0F		ANI 0FH	Mask the upper nibble
4117	80		ADD B	Get the binary data in A register.
4118	32 01 42		STA 4201H	Save the binary data in memory
411B	76	HLT		Halt program execution

Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 5

01/11/22 BCD TO BINARY CONVERSION

AIM:

Write an assemby language program to convert a two digit BCD (8-bit) data to binary data. The BCD data is stored in the 4200H and store the binary data in 4201H

Algorithm

1. Get the BCD data in A register and save in E-register
2. Mask the lower nibble (units) of the BCD data in A register
3. Rotate the upper nibble to lower nibble position and save in B-register.
4. Clear the accumulator.
5. Move 0AH to C-register
6. Add B-register to A-register
7. Decrement C register. If ZF=0 go to step 6. If ZF=1, go to next step.
8. Save the product in B register
9. Get the BCD data in A register from E-register and mask the upper nibble.
10. Add the units to product
11. Store the binary value
12. Stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RESULT :

Obtained the ALP to convert an 8 bit, two digit BCD data to binary data

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM (TO ADD AN ARRAY OF DATA)

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	21 00 42		LXI H, 4200	Set pointer for data
4103	46		MOV B, M	set or no. of data
4104	0E 00		MVI C, 00H	Clear register to account for carry
4106	AF		XRA A	Clear accumulator, initial sum = 0
4107	23	REPT	INX H	
4108	86		ADD M	Add an element of the array to sum
4109	D2 0D41		JNC AHEAD	If No carry then jump to Ahead
410C	DC		INRC	IF CF=1, increment C-register
410D	05	AHEAD	DCR B	
410E	C20741		JNZ REPT	Repeat addition until count is zero.
4111	320043		STA 4300	Store low byte of sum in memory.
4114	79		MOV A, C	Move contents of C to A
4115	320143		STA 4301	Store high byte of sum in memory
4118	76		HLT	Halt the program execution

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 6

14/11/22 ADDITION OF AN ARRAY OF DATA

15

AIM:

To write an assembly language program to all add an add an array of data stored in memory from 4200H + N. The first element of the array gives the number of elements in the array. Store the result 4300H and 4301H. Assume the sum doesnot exceed 16 bit

ALGORITHM:

1. Load the address of the first element of the array in HL pair (painter).
2. Move the count to B-register
3. Clear C-register for carry
4. Clear accumulator for sum.
5. Increment the painter (HL pair)
6. Add the content of memory addressed by HL to accumulator
7. Check for carry. If carry. If carry = 1, go to step 8, or if carry = 0, goto ste
8. Increment C-register
9. Decrement the count
10. Check for zero of the count. If ZF = 0 go to step 5 or If ZF = 1, go to next step.
11. Store the content of accumulator (low byte of sum)
12. Move the content of C-register (high byte of sum) to accumulator. Store the content of accumulator in memory.
13. Step.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

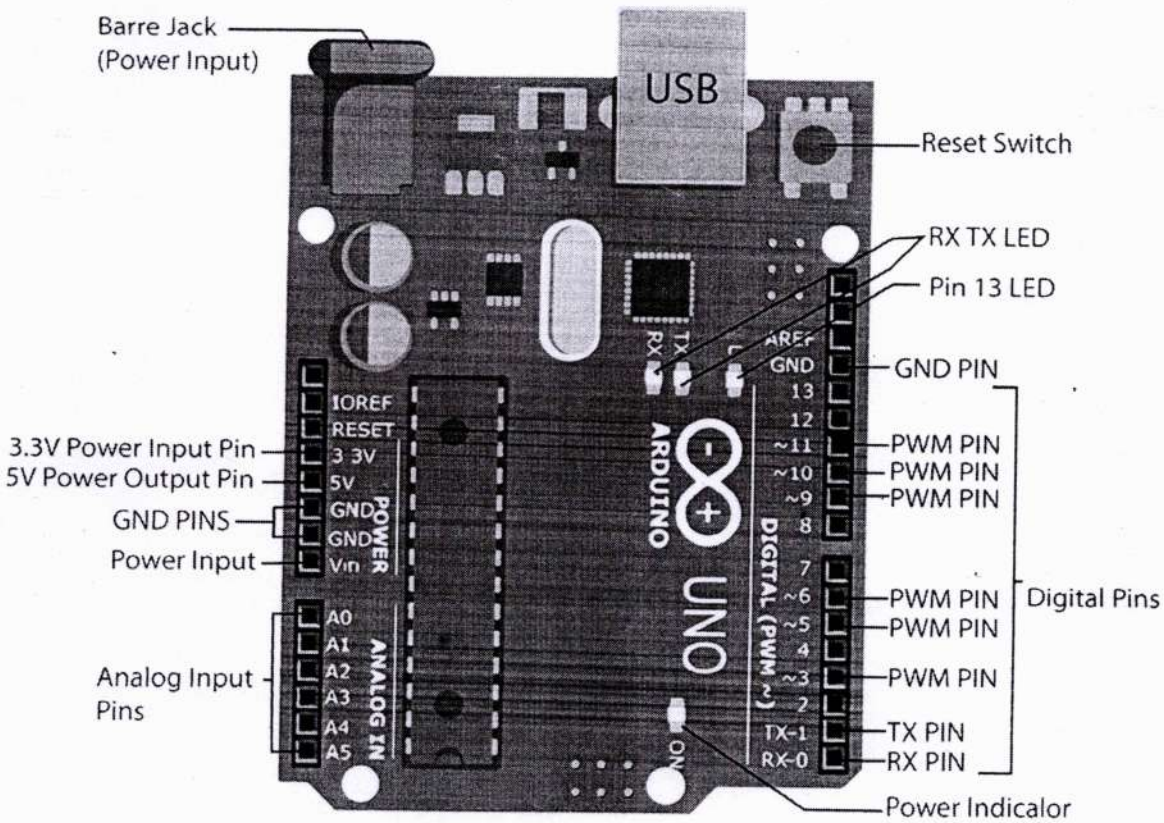
	Memory Address	Content
Count :	4200	07
	4201	C2
	4202	45
	4203	B3
Array	4204	F4
	4205	7C
	4206	ED
	4207	16
Sum	4300	2D
	4301	04

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Obtained the ALP to add an array of DATA and verify the result.

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR



Arduino Uno

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT 7

21/11/22 FAMILIARIZATION OF ARDUINO IDE 17

AIM:

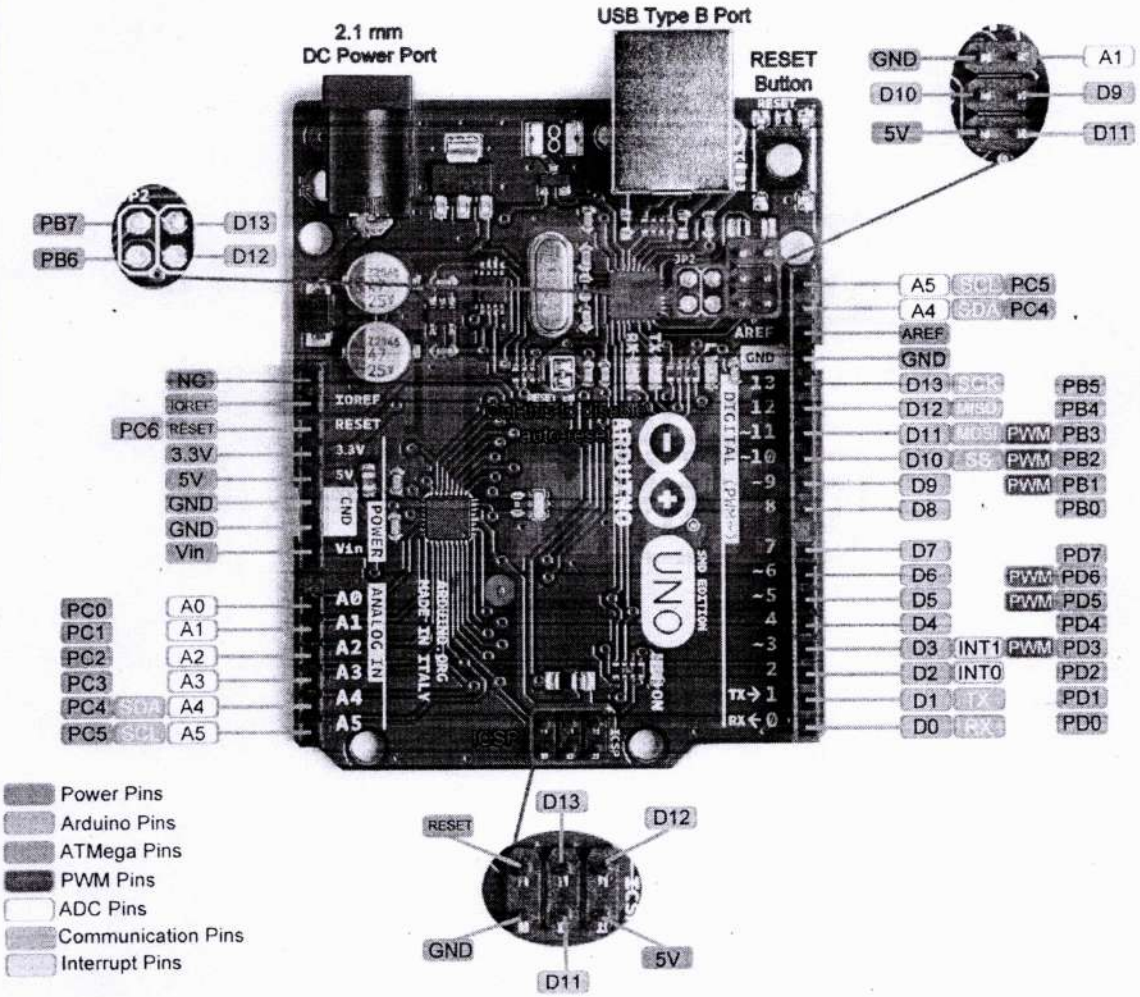
Familiarization of Arduino IDE

THEORY:

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on bottom, or a Twitter message - and turn it into an output - activating a motor, turning on a LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on processing.

Arduino also simplifies the process of working with microcontrollers, but it offers some advantages for teachers, students, and interested amateurs over other s/ms which are expensive, cross-platform, simple, clear programming environment, Open Source and extensible hardware etc.

The basis structure of the Arduino programming language is fairly simply and runs in at least two parts. These two required parts, or functions, enclose blocks of statements where setup() is the preparation, loop() is the execution. Both functions are required for the program to work. The setup function should follow the declaration of any variables at the very beginning of the program. It is the first function to run in the program, is run only once, and is used to set pinMode or initialize serial communication.



Pin Diagram of Arduino Uno

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

The loop function should follow the declaration of any variables at the very beginning of the program. It is the first function to run in the program, is run only once and is The loop function follows next and includes the code to be executed continuously - reading inputs, triggering outputs etc. This function is the core of all Arduino programs and does the bulk of the work. Curly braces ({}) define the beginning and the end of function blocks and statement blocks such as the void loop() function and the for and if statements.

Programming using Arduino IDE

Step 1 - Download Arduino IDE software: You can get different versions of Arduino IDE from the Download page on the Arduino Official website. You must select your software, which is compatible with your operating system (Windows, IOS, or Linux). After you file download is complete, unzip the file

Step 2 - Power up your board: The Arduino Uno automatically draw power from either, the USB connection to the computer or an external power supply. Connect the Arduino board to your computer

Step 3 - Launch Arduino IDE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Arduino Instruction Set

Structure

- setup()
- loop()

Control Structures

- if
- if...else
- for
- switch case
- while
- do... while
- break
- continue
- return
- goto

Further Syntax

- ; (semicolon)
- {} (curly braces)
- // (single line comme
- /* */ (multi-line comr
- #define
- #include

Arithmetic Operators

- = (assignment operator)
- + (addition)
- - (subtraction)
- * (multiplication)
- / (division)
- % (modulo)

Comparison Operators

- == (equal to)
- != (not equal to)
- < (less than)
- > (greater than)
- <= (less than or equal to)
- >= (greater than or equal to)

Boolean Operators

- && (and)
- || (or)
- ! (not)

Pointer Access Operators

- * dereference operator
- & reference operator

Variables

Constants

- HIGH | LOW
- INPUT | OUTPUT
- true | false
- integer constants
- floating point constants

Data Types

- void
- boolean
- char
- unsigned char
- byte
- int
- unsigned int
- word
- long
- unsigned long
- float
- double
- string - char array
- String - object
- array

Functions

Digital I/O

- pinMode()
- digitalWrite()
- digitalRead()

Analog I/O

- analogReference()
- analogRead()
- analogWrite() - PWM

Advanced I/O

- tone()
- noTone()
- shiftOut()
- pulseIn()

Time

- millis()
- micros()
- delay()
- delayMicroseconds()

Math

- min()
- max()
- abs()
- constrain()
- map()
- pow()
- sqrt()

Trigonometry

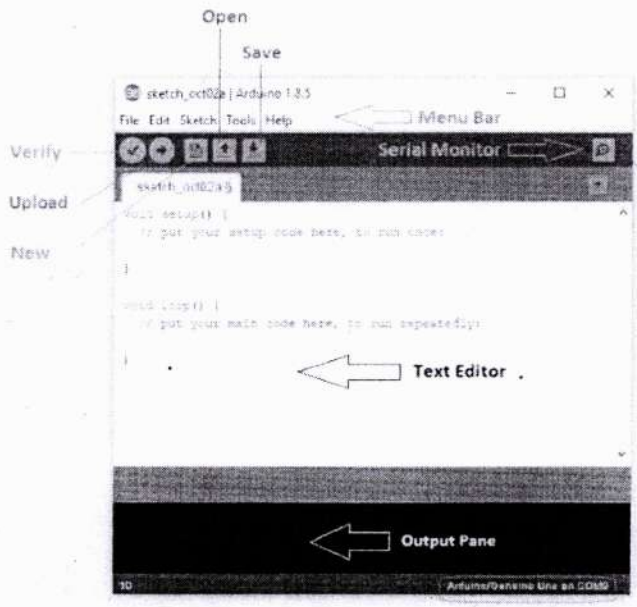
- sin()
- cos()
- tan()

Random Number

- randomSeed()
- random()

Bits and Bytes

- lowByte()
- highByte()
- bitRead()
- bitWrite()
- bitSet()
- bitClear()
- bit()



The Arduino Type and Port I'm using right

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Step 4 - Open your first project : Once the software starts, you have two options -

- Create a new project
- Open an existing project example

To open an existing project example, select File → Example → Basis → Blink.

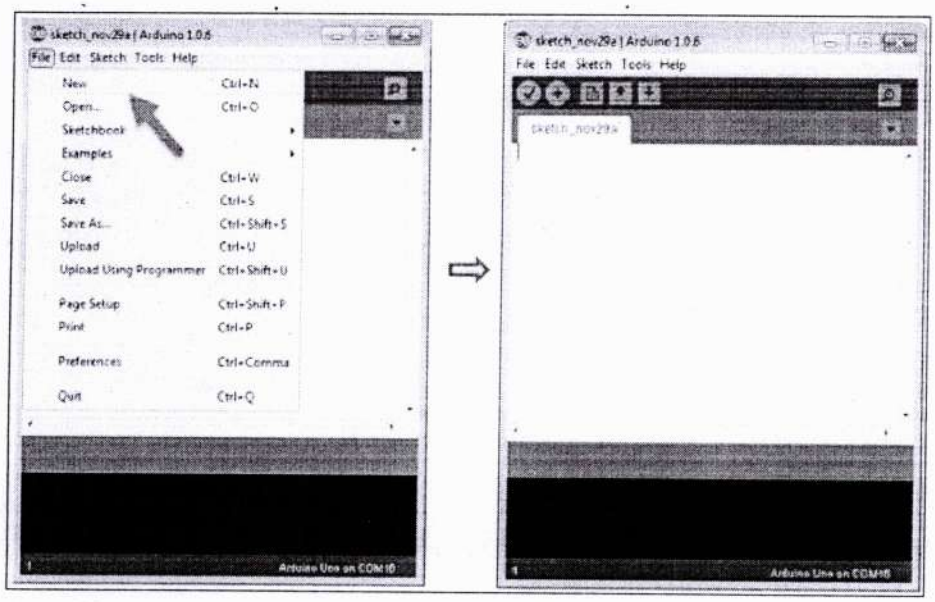
Here, we are selecting just one of the examples with the name Blink. It turns the LED on and off with some time delay. You can select any other example from the list

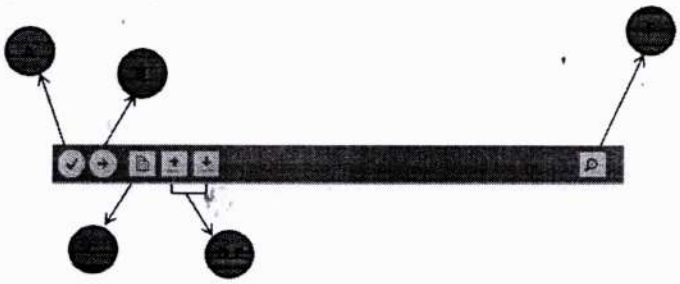
Step 5 - Select your Arduino board : To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer.

Go to Tools → Board and select your board.

Step 6 - Select your serial port : Select the serial devices of the Arduino board. Go to Tools → Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.

Step 7 - Upload the program to your board : Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the





A – Check if there is any compilation error.

B – Upload a program to the Arduino board.

C – Shortcut to create a new sketch.

D – Open one of the example sketch.

E – Used to save your sketch.

F – Serial monitor for serial data transfer

Arduino IDE toolbar. Now, simply click the "Upload button in the environment. Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status bar

RESULT :

Familiarized with Arduino IDE

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Connection Diagram:

Circuit for blinking of Internal LED (No External connection required)

Circuit for blinking of external LED on Pin 1

Sample Program for external LED blink on Pin-1:

```
void setup()                    // run once
{
pinMode(1, OUTPUT);             // sets pin 1 as output
}
void loop()                     // run over and over again
{
digitalWrite(1, HIGH);          // turns the LED on
delay(1000);                    // pauses for 1 second
digitalWrite(1, LOW);           // turns the LED off
delay(1000);                    // pauses for 1 second
}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 8

28/11/22 LED CONTROL USING ARDUINO

AIM

a) Blinking inbuilt LED with different on off time delays

b) Blinking externally interfaced LED with different on off time delays.

Hardware Required:

1.	Arduino board	Arduino Uno	1
2.	LED		1
3	Resistor	220 Ohm	1
4.	Bread board and connection wires		

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

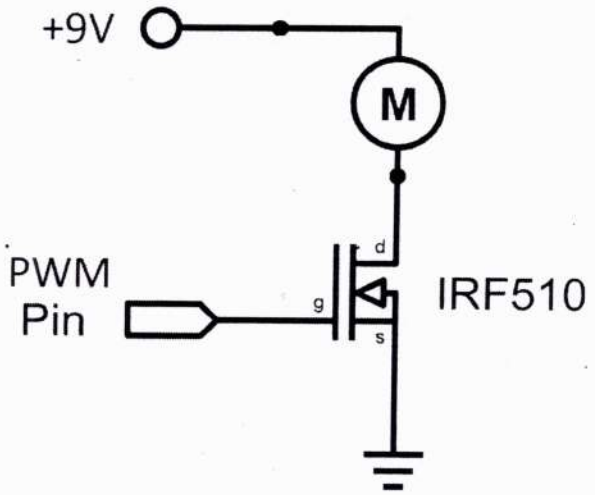
RESULT

Performed LED control using Arduino

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Connection Diagram:



Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 9

05/12/22 DC MOTOR SPEED CONTROL USING ARDUINO 23

AIM :

To control the speed of a DC motor using MOSFET driven by PWM signal from Arduino module

Hardware Required :

1. Arduino board	Arduino Uno	1
2. MOSFET or MOSFET based motor driver board	IRF 510	1
3. DC Motor	9V	1
4. Bread board and connection wires		

STUDY :

To control a load with more than 40ma current requirement using the Arduino, a MOSFET or transistor could be used to switch higher current loads. Also motor speed control requires voltage variation, which could be achieved by using the PWM variable voltage signal available from the PWM enabled digital pins of the Arduino.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Sample Program for DC motor speed control:

```
void setup()
{
pinMode(5, OUTPUT);                 // sets PWM Pin 5 as output
}
void loop()
{
for (int i=0; i<255; i++)           // Motor speed increasing
{
analogWrite(5, i);                  // turns MOSFET on
delay(250);                         // pauses 1/4 second
}
delay(1000);                        // pauses 1 second

for (int i=255; i>0; i--)           // Motor speed decreasing
{
analogWrite(5, i);                  // turns MOSFET on
delay(250);                         // pauses 1/4 second
}
delay(1000);                        // pauses 1 second
}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

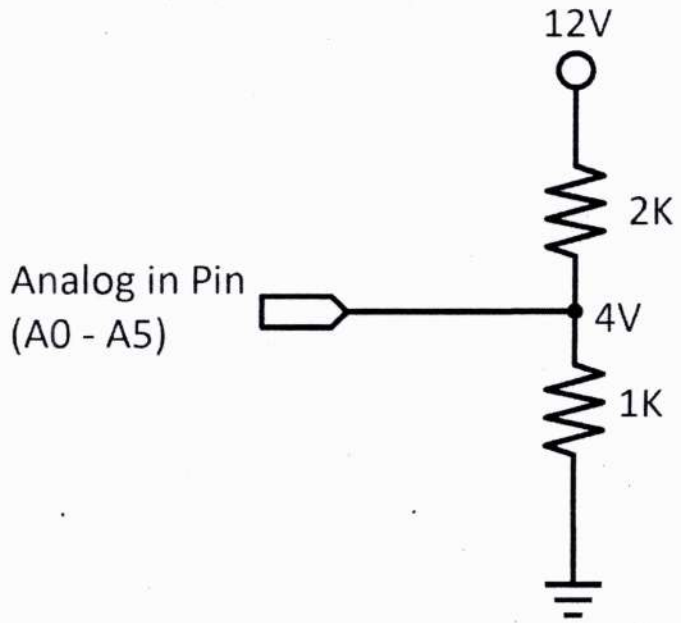
RESULT

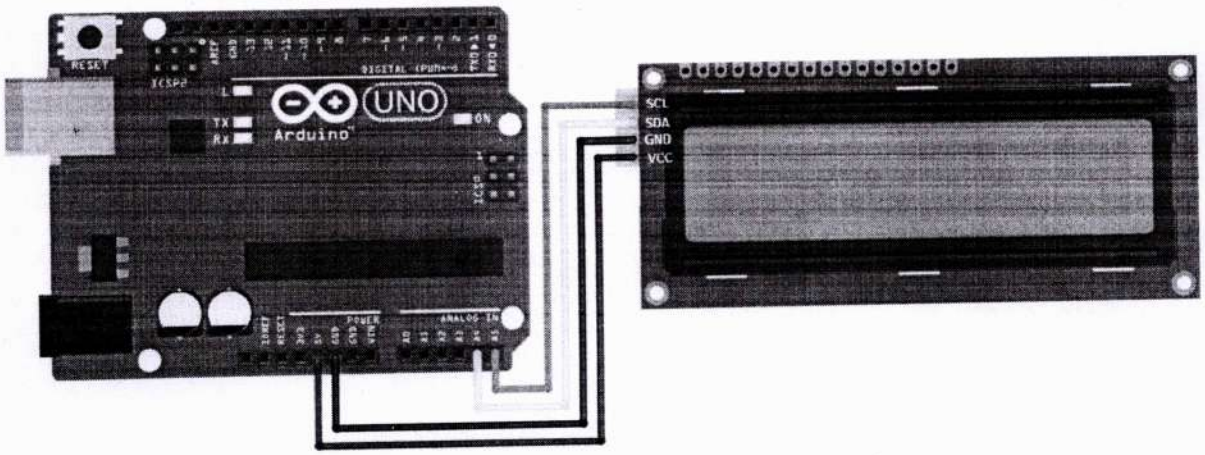
Controlled the speed of a DC motor using MOSFET driven by PWM signal from Arduino module

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Connection Diagram:





I2C Line	Pin in Arduino
SDA	A4, SDA
SCL	A5, SCL

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 10

12/12/22 VOLTAGE MEASUREMENT USING ARDUINO 25

AIM:

Arduino based voltage measurement of 12V solar PV module or 12V battery and displaying the measured value using 12C LCD display.

Hardware Required:

1. Arduino board	Arduino Uno	1
2. LCD display with 12C adapter	16x2 (1602) Character (5x7 Dot Matrix Character and Cursor) Green Backlight LCD Display with attached 4 pin 12C adapter	1
3. Voltage Source	9V Battery	1
4. Resistor	1K, 2K	1 each
5. Bread board and connection wires		1

THEORY:

Arduino can only measure a maximum of 5V on the analog pins, and hence a potential divider arrangement using resistors is used to reduce the voltage to be measured and later a multiplication factor is used in the program to scale the obtained value to actual voltage value

LCD 16X2:

An electronic device that is used to display data and the message is known as LCD 1602. It includes 16 columns and 2 Rows so it can display 32 characters (16x2) in total. Every character will be made with (5x8) (40) Pixel

Sample Program:

```
#include <Wire.h>                    // library for I2C
#include <LiquidCrystal_I2C.h>   // Arduino library for I2C LCD displays
LiquidCrystal_I2C lcd(0x27,20,4);   //Set the LCD address to 0x27 (default)


void setup()
{
 lcd.init();                    // Initialize the lcd
 lcd.backlight();               // Turn on backlight of lcd
 lcd.setCursor(2,0);            //Setting display curser position (Col 2, Row 0)
 lcd.print("VOLTMETER");            // Show on LCD display from cursor position
}


void loop()

{
 lcd.setCursor(0,1);                // Set Cursor to (Column 0, Row 1)
 lcd.print("VOLT =");               // Display the characters
 float mf = 3;                      // Multiplication factor corresponding to resistors
 int x = analogRead(A0);            // Read input Voltage from A0
 float value = (x*mf*5)/1024;       // Convert input to actual voltage value
 lcd.setCursor(6,1);                //Set Cursor to (Column 6, Row 1)
 lcd.print(value);                  // Display the voltage
 delay(500);                        // Delay 0.5s
}
```

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Dots and the the total pixels within this LCD, can be calculated (by) 32 x 40 or 1280 pixels. The data register inside the display is used to save the data to exhibit on the LCD.

I2C Protocol:

The inter-Integrated Circuit (I2C) Protocol is a protocol intended to allow multiple peripheral digital integrated circuits to communicate with one or more controller chips. I2C requires only two wires to communicate (with) in serial mode, but those two wires can support upto 1008 peripheral devices, each having an address. Each I2C bus consists of two signals: SDA (Serial Data) - The Data signal and SCL (Serial Clock) - the clock signal. The clock signal is always generated by the Master or the current bus controller.

RESULT:

Measured the voltage of 12V solar PV module and displayed the measured value using I2C LCD display.

PROGRAM

ADDITION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	C3		CLR C	Clear C
4101	74 20		MOV A, # DATA	Move the data to A register
4103	24 10		ADD A, # DATA	Add the data with A
4105	90 4500		MOV DPTR, # 4500	Set the pointer to 4500
4108	F0		MOV X@DPTR, A	Store the results in memory
4109	80 FE	END	SJMP END	Stop the program.

SUBTRACTION :

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	C3		CLR C	Clear the carry flag
4101	79 20		MOV A, # DATA	Move the lower nibble of data to A register
4103	9410		SUBB A, # DATA	Subtract the data with A register
4105	90 45 00		MOV DPTR, # 4500	Set the pointer to 4500
4108	F0		MOV X @ DPTR, A	Store the result in memory
4109	80 FE		SJMP END	Stop the program

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 11

19/12/22 ARITHEMATICS OPERATIONS USING 8051 27

AIM:

To write an assembly language program (AIP) for performing arithmetic operations such as addition, substraction, multiplication and division using 8051.

ALGORITHM:

1. Start the program.
2. Load the two inputs into the memory
3. Perform addition, substraction, multiplication and division
4. Stop the program.

Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

MULTIPLICATION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	74 65		MOV A, #DATA	Move the data to A register
4102	75 F0 08		MOV B, # DATA	Move the data to B register
4105	A4		MUL AB	Mutliply A and B
4106	90 45 00		MOV DPTR, #4500	Load the address of data in DPTR
4109	F0		MOV X @DPTR A	Store the lower byte of product.
410A	A3		INC DPTR	Increment data pointer
410B	F5 F0		MOV A,B	Move the content of B register to A register
	F0		MOVX @ DPTR, A	Move the data to DPTR
410E	80FE	END	SJMP END	

Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

DIVISION

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	74 65		MOV A,# DATA	Move the data to A
4102	75 F008		MOV B, # DATA	Move the data to B
4105	84		DIV AB	Divide A and B
4106	90 4500		MOV DPTR,# 4500	Load the address of data in DPTR
4109			MOVX @DPTR ,A	Store the lower byte of product
410A	A3		INC DPTR	Increment data pointer
410B	E5F0		MOV A ,B	Move B to A
410D	F0		MOVX @DPTR,A	Store the A value
410E	80 FE		SJMP END	Stop

OBSERVATION

8 BIT Addition			8 BIT Subtraction		
INPUT	OUTPUT		INPUT	OUTPUT	
DATA	ADDRESS	DATA	DATA	ADDRESS	DATA
0·3 0·2	4500	0·5	0·8 0·2	4500	0·6

8 BIT Multiplication			8BIT DIVISION		
INPUT	OUTPUT		INPUT	OUTPUT	
DATA	ADDRESS	DATA	DATA	ADDRESS	DATA
0·2 0·4	4500 4501	08 00	08 04	4500 4501	02 00

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RESULT :

Executed assembly language program (ALP) for performing arithmetic operations such as addition, substraction, multiplication and division using 8051.

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
2100			ORG 2100_H	Specify the program starting address
2100	90 24 00		MOV DPTR, #2400_H	Set DPTR as pointer for array
2103	F0		MOVX A, @DPTR	Get the count value in A
2104	F8		MOV R0, A	Set R0 as counter for N-1 comparison
2105	18		DEC R0	
2106	A3		INC DPTR	Let DPTR point to first element of array
2107	E0		MOVX A, @DPTR	
2108	FC		MOV R4, A	Let first element as largest and save it in R_4
2109	A3	AGAIN	INC DPTR	Make DPTR point next element of array
210A	E0		MOVX A, @DPTR	Get next element of array in A
210B	FA		MOV R2, A	Save it in R2
210C	C3		CLR C	Clear carry flag
210D	9C		SUBB A, R4	Substract the current largest from A
210E	40 02		JC AHEAD	Check for carry, if carry is set go to AHEAD
2110	EA		MOV A, R2	If carry is not set
2111	FC		MOV R4, A	Then save the content of R2 as current largest
2112	D8 F5	AHEAD	DJNZ R0, AGAIN	Decrement count and go to AGAIN if count is not zero otherwise go to next instruction

EXPERIMENT - 12

03/01/23 SEARCH FOR LARGEST DATA IN AN ARRAY 30

AIM:

Write an Assembly language program to search the largest data in an array of data stored in memory.

ALGORITHM:

1. Set DPTR as pointer for data array
2. Load the count value N in A and save in R0
3. Decrement R0 to set count for N-1 comparison
4. Increment DPTR
5. Load the first data of array in A and save it as current target in R4 register
6. Increment DPTR
7. Get a data and array in A register and save it in R2 register
8. Clear carry flag and substract the current lagged in R4 from A
9. Check carry flag. If carry is set, then go to step II, otherwise goto next step
10. If carry is not set, then the content of R2 is larger than R4 and so move R2 to R4 via A.
11. Decrement R0 and check whether it is zero. If R0 is not zero, then go to step II, otherwise go to next step.
12. Load the address of the memory where largest data is to be stored.
13. Move the largest data from R4 to A and save in memory pointed by DPTR

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
2114	90 25 00		MOV DPTR, # 2400_H	Load the address of result in DPTR
2117	EC		MOV A, R4	Move the largest data to A
2118	FD		MOVX @DPTR, A	Save in external memory
2119	80 FE		SJMP HALT	
211B			END	Assembly END

OBSERVATION

INPUT		OUTPUT
Count	Array	Largest Data
06	2401 - 7F 2402 - 1C 2403 - 42 2404 - 57 2405 - 13 2406 - FE	2500 - FE

Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RESULT :

Obtained an assembly language program to search the largest data in an array of data in the memory.

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

PROGRAM

ADDRESS	OPCODE	LABEL	MNEMONICS	COMMENTS
4100	90 45 00		MOV DPTR,#4500	Load the source data address in DPTR
4103	E0		MOVX A,@DPTR	Move data from external memory to A register
4104	75 F0 64		MOV B, #64	Move data to B
4107	84		DIV AB	Divide A and B
4108	90 45 01		MOV DPTR, #4500	Load the address of data in DPTR
410B	F0		MOVX @DPTR, A	Store the lower byte of product
410C	E5 F0		MOV A, B	Move B to A
410E	75 F0 0A		MOV B, #04	Move data to B
4111	84		DIV AB	Divide A and B
4112	A3		INC DPTR	Increment data pointer
4113	F0		MOVX @DPTR, A	Store the higher byte
4114	A3		INC DPTR	Increment data pointed
4115	E5 F0		MOV A, B	Mov B to A
4117	F0		MOVX @DPTR, A	Store the higher byte
4118	80 FE	END	SJMP	Stop

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT - 13

09/01/23 HEXADECIMAL TO DECIMAL CONVERSION 32

AIM:

To perform hexadecimal to decimal conversion

ALGORITHM:

1. Load the number to be converted into the accumulation
2. If the number is less than 100 (64H), go to the next step; otherwise, substract 100 (64H). Here the substraction repeatedly until the remainder is less than 100 (64H) Have the current (100's value) in seperate register which is the carry.
3. If the number is less than 10 (0AH), go to next step; otherwise substract 10 (0AH), go to repeatedly until the remainder is less than 10 (0AH). Have the count (item's value) in seperate registers
4. The accumulator now has the units.
5. Multiply then ten's value by 10 and it with the units.
6. Store the result and carry in the specified memory location.

Leena

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

RESULT :

Obtained an assembly language for conversion for hexadecimal to decimal.

HODEEE

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Completed all 13 experiments

03/01/23

A Vaishakh. M. Nayeem

APEEE.

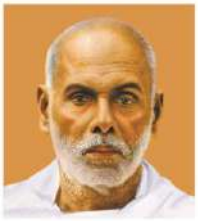
Leena

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

Est. 2003

Sree Narayana Guru College of Engineering & Technology

CHALAKKODE P.O., KOROM, PAYYANUR, KANNUR-670 307



DEPARTMENT OF MECHANICAL ENGINEERING

CERTIFICATE

Date: 10 / 8 /2023

This is to certify that Mr./ Ms. ASHWIN JOHN

of Class S6 Division _____ Roll No. SNC20ME003

has satisfactorily completed the course experiments in practical

MEL-332 computer Aided Design and Analysis Lab

in the academic year of 2022 / 2023

in the Institution SNGCET

Teacher

Examiner

Principal

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

Institution Rubber Stamp

INDEX

Sr. No.	Name of the Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
1	Solid Works	2-6	14/2/23	27/2/23	
2	Orthographic views from 3D models	7	14/2/23	27/2/23	
3	Orthographic views from 3D models	8	28/2/23	6/2/23	
4	3D modelling and Assembling of Gib and cotter joint	9-10	7/3/23	13/3/23	
5	3D modelling and Assembling of flange Cd coupling	11-12	14/3/23	20/3/23	
6.	Experiment No: 5 Knuckle Joint.	13-14	21/3/23	27/3/23	
7.	3D modelling and assembling of Plummer block	15-16	28/3/23	3/4/23	
8.	Structural Analysis on cantilever Beam	17	4/4/23	10/4/23	
9.	Structural analysis on 2D Truss	18	11/4/23	17/4/23	
10	Structural analysis on 3D part	19	11/4/23	17/4/23	
11.	motion study of screw and Nut	20	18/4/23	19/6/23	
12	Thermal problem on mixed boundary Analysis	21	18/4/23	19/6/23	
13.	Fluid flow analysis.	22	20/6/23	21/6/23	

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

HOD ME

SOLID WORKS

Solid work is a 3D mechanical CAD programme and is being developed by dessault system.

Solid works is a mechanical design software to build programming models of parts and assemblies. It also includes various analysis and synthesis process. A solid is the computer type of geometric module used in CAD system. It contains all the mix frames and surface geometry to fully describe the edge and the face of mold.

Solid works includes many enhancements most in a CAD system. It contains all the enhancements most in delivered response to customer requist.

The top enhancements for solid works 2013 provides improvements to existing products and innovative new functionability.

MODELING METHODOLOGY

Parameters refers to constrain where the value determines the shape of geometry of the model or assembly. Parameters are be either numeric parameters such as line length or circle diameter of geometric parameters, such as tangent parallel horizontal or vertical etc.

Design Intent is how the circles of the part wants to be respond to changes and updates, for example you would want the hole at the top of a beverage can to stay at the top surface regardless of the height or size of the can.

Features refers to bountaling blades of the part are the shapes and operations that contract, the part shape based function typically.

Teacher's Signature:

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

begin with 2D or 3D Sketch of shapes such as holes slots etc. operation based features are not sketch based and include features such as fillets, chamfers etc.

Building a model in Solidworks usually start with a 2D Sketch. The consist of geometry such as points, line are corners. Dimensions are added to the sketch to define the size and location of the geometry. Relations are used to specify the attributes such as tangency, Parallelism, perpendicular. The parameteric nature at solid works means that dimensions and relations drive the geometry, no way either grend.

In an assemble the analog to sketch relations are mates just as sketch relation define conditions such as tangency, parallelism with respect sketch geometry, assembly mates define equivalent relations with respect to the individual solid works including additional advanced matine features such as gear and cam following rutine.

finally, drawings can be created either from parts as resembles. views are automatically generated from solid model and notes dimensions and tolerance can be easily added to the drawing as need. The drawing module includes

1. Drawing and elefaling
2. Assemblies
3. Motion study
4. Parts and function
5. Roling
6. Short metal
7. Simulation.

Teacher's Signature:

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

User Interface

Main elements at the solid works user interface are

1. Member
2. command manager
3. Property manager
4. feature manager
5. configuration manager
6. Search assistant
7. Status bar
8. task Plane
9. Tool bar

Basic Concepts:

The Solid work model consist at 3D solid geometry in a part of assembly document. Drawing are created from model or by drafting view in a drawing document. We begin with a sketch. create a basic features and the add more features to our model. It is possible to eletino our design by adding editing our decoding features. Associating between part, assemblies and drawings assume that changes made to one document or Lie are automatically made to all other document and views

Assemblies:

In Solid works, we can create assemblies containing of many component which can be part of other assemblies called sub assemblies. To create an assembly from parts.

Teacher's Signature:

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

1. ~~Cr~~ click make assemble from part / assembly or file → assembly part
Assembly open with ~~the~~ insert component property manager device
2. Click in the graphics area to add the parts to the assembly There are many ways to add the component the new or existing assembly
a) Use the Insert ~~tom~~ component
b) Drag from the 'file explore' tab in the task plan
c) Drag from open documents windows
d) Drag from design library in the task placed.

Mates :
mates create geometric relationship between assembly components
eg: A coincident mates force two planes force to become coplanes
Types of mates

* Angle mates
* coincident mates
* Distance mate
* Lock mate
* Parallel and perpendicular

FLOXPRESS
Solid works floxpress is a fluid dynamics application that calculating ~~that~~ calculate how fluid ~~fluid~~ flow through operator assembly modules based on the calculated velocity fluid. We can find problem areas in our device and ~~tom~~ improve them before manufacturing

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's signature:

Steps

1. Preparing the model for analysis enclose the inlet and outlet opening with lide
2. Start Solid works flowpress
   Click tools → Solid works flowpress
3. cheak geometry
4. Select fluid
5. Selecting the flow inlet condition.
6. Selecting the flow outlet condition
7. Solving the mode
   Click Solve
8. Viewing the results.

HOD ME

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR
Examiner's Signature

EXPERIMENT NO : 1

ORTHOGRAPHIC VIEWS FROM 3D MODELS

Aim: To familiarize the 3D modelling of various design of objects and to generate 2D drawings for shop floor.

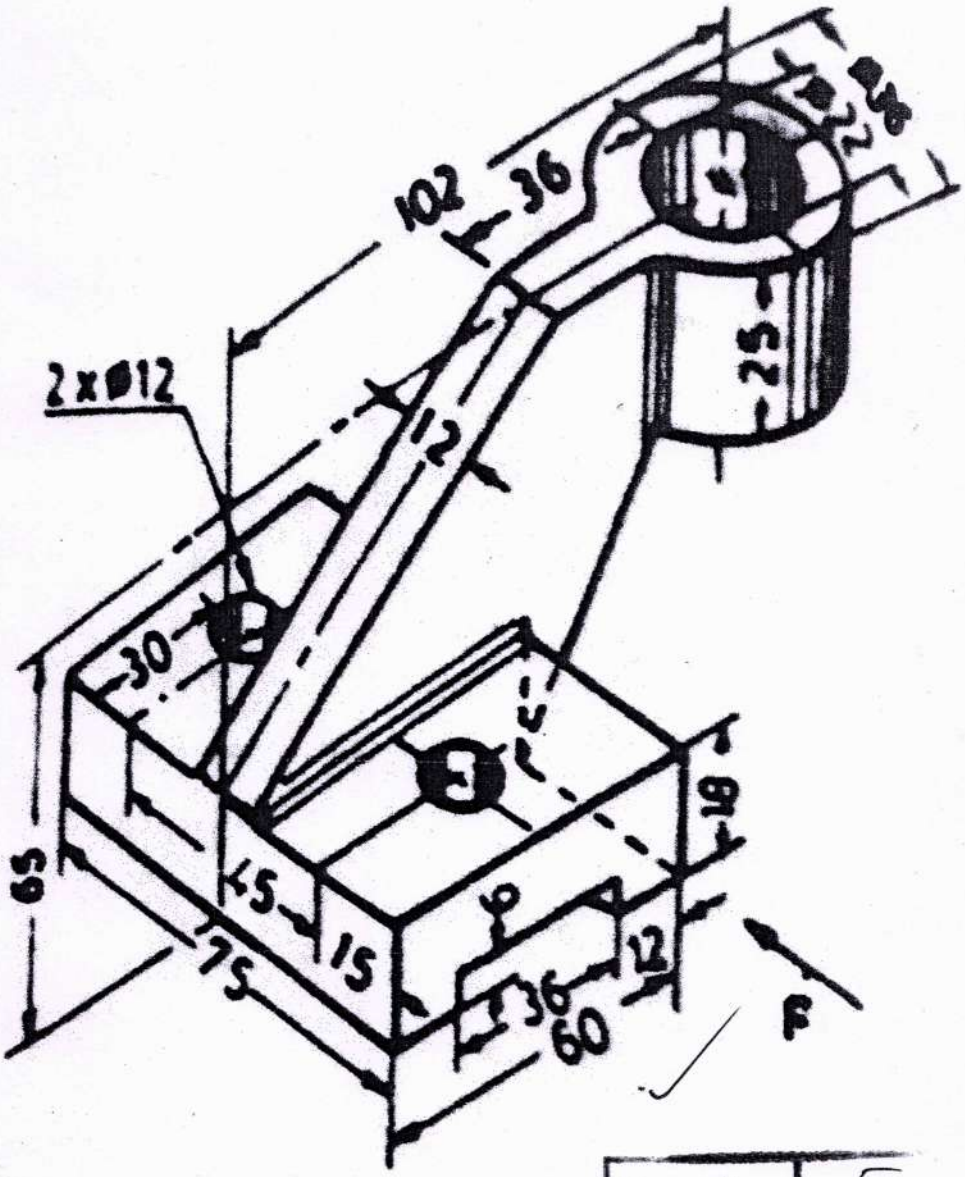
Equipments Required:

1. A personal computer loaded with any one of the following application software
   Solidworks, CATIA, PRO-E
2. A3 or A4 Plotter or Printer.

Procedure:

1. Execute the application software ie SOLIDWORKS
2. Set unit "mmgs"
3. Select new part
4. Select suitable 3D commands (Extrude, Revolve, Loft and Sweep).
5. Select the required Plan (Top, front, and side) and Sketch the 2D profile to be converted in 3D with required exact dimensions.
6. Exit the 2D sketch and execute the selected 3D command
7. Repeat the above steps from 4th until the desired object is completed.
8. 3D modifying commands are also can be used as and when required (Fillet, chamfer, mirror, pattern etc)
9. On completion of 3D modelling, save and close the file and open the new module 2D drafting and generate 2D drawing of the 3D model created previously
10. 2D drafting file is any another file that can be saved and closed.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR



Procedure	5
Conduction	5
Result	5
Viva	10
Record	5
	30

HoD ME

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT NO : 2

ORTHOGRAPHIC VIEWS FROM 3D MODELS

Aim :- To familiarize the 3D modelling of various design of objects and to generate 2D drawings for shop floor.

Equipments required;

1. A Personal computer loaded with any one of the following application Software.

   SOLIDWORKS, CATIA, PRO-E

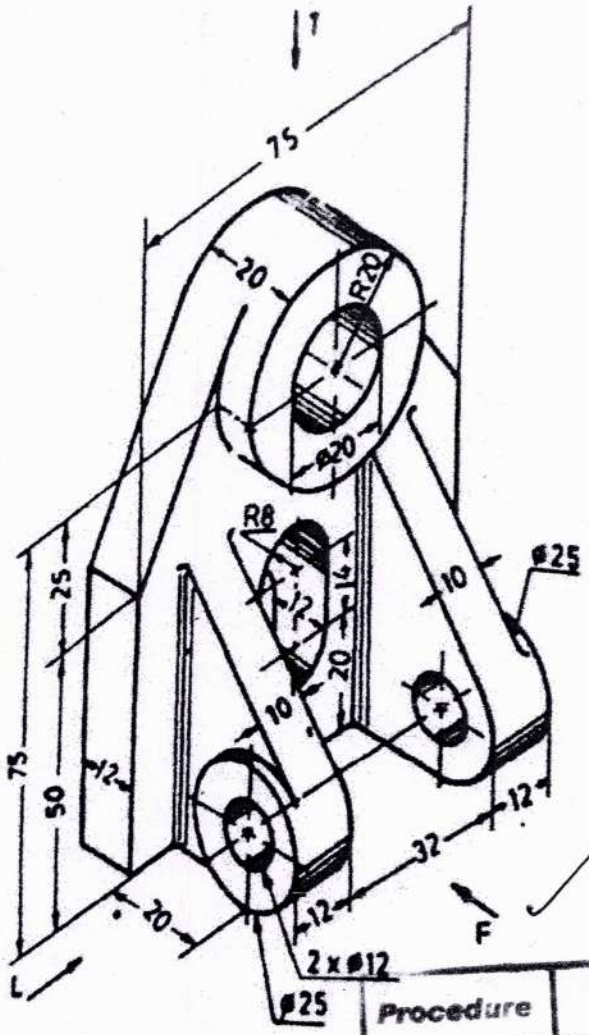
2. A3 or A4 Plotter or Printer

PROCEDURE:

1. Execute the application Software ie SOLIDWORKS
2. Set unit "mmgs"
3. Select new Part
4. Select Suitable 3D commands (Extrude, Revolve, Loft, and Sweep).
5. Select the required Plan (Top, front, and side) and sketch the 2D profile to be converted in 3D with required exact dimensions
6. Exit the 2D Sketch and Execute the selected 3D command
7. Repeat the above Step from 4th until the desired object is completed
8. 3D modifying commands are also can be used as and when required (fillet, chamfer, mirror, Pattern etc)
9. On completion of 3D modelling, save and close the file and open the new module 2D drafting and generate 2D drawing of the 3D model created previously
10. 2D drafting file is an another file that also to be saved and closed.

Dr. LEENA A.V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Staff Signature:



Procedure	5
Conduction	5
Result	5
Viva	9
Record	5

29

HOD ME

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT No 3

3D MODELLING AND ASSEMBLING OF GIB AND COTTER JOINT

Aim: To familiarize the 3D modelling of various design of objects and to assemble together to form a product having some engineering functions

Equipments required:

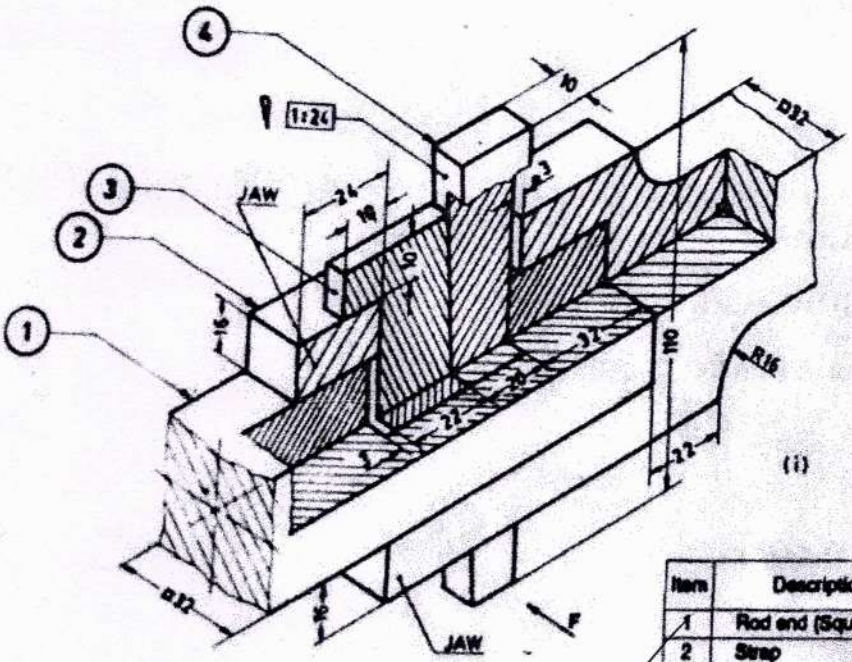
1. A personal computer loaded with any one of the following application Software SOLIDWORKS, CATIA, PRO-E
2. A3 or A4 Plotter or Printer

Procedure:

1. Execute the application software ie SOLIDWORKS
2. Set unit 'mmgs'
3. Select new part
4. Select suitable 3D commands (Extrude, Revolve, Loft and Sweep).
5. Select the required plan (Top, front and side) and sketch the 2D profile to be converted in 3D with required exact dimension
6. Exit the 2D sketch and execute the selected 3D command
7. Repeat the above step from 4th until the desired object is completed.
8. 3D modifying commands are also can be used as and when required. (Fillet, chamfer, mirror, pattern etc)
9. On completion of 3D modelling, save and close the file and open the new files for each model and model every part in the assembly and save them separately with their part name and close all files.
10. Open new assembly and open the base part for the assembly
11. Insert [illegible] the assembly, and open the base part

DR. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:



ITEM LIST

Item	Description	Qty.	Material
1	Rod end (Square)	1	M. S.
2	Strap	1	M. S.
3	Gib	1	M. S.
4	Cotter	1	M. S.

Procedure	5
Conduction	5
Result	5
Viva	9
Record	5

29

HOD ME

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

for the assembly

11. insert all other parts as per the assembly sequence and make the assembly relationship with the base part or other parts inserted using mate command.

12. Save the assembly file with suitable name, and close.

13. It is possible to generate 2D drawing of assembly whenever required with 2D drafting module.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT NO : 4

3D MODELLING AND ASSEMBLING OF FLANGED COUPLING

Aim: To familiarize the 3D modelling of various design of objects and to assemble together to form a product having some engineering functions.

Equipments required:

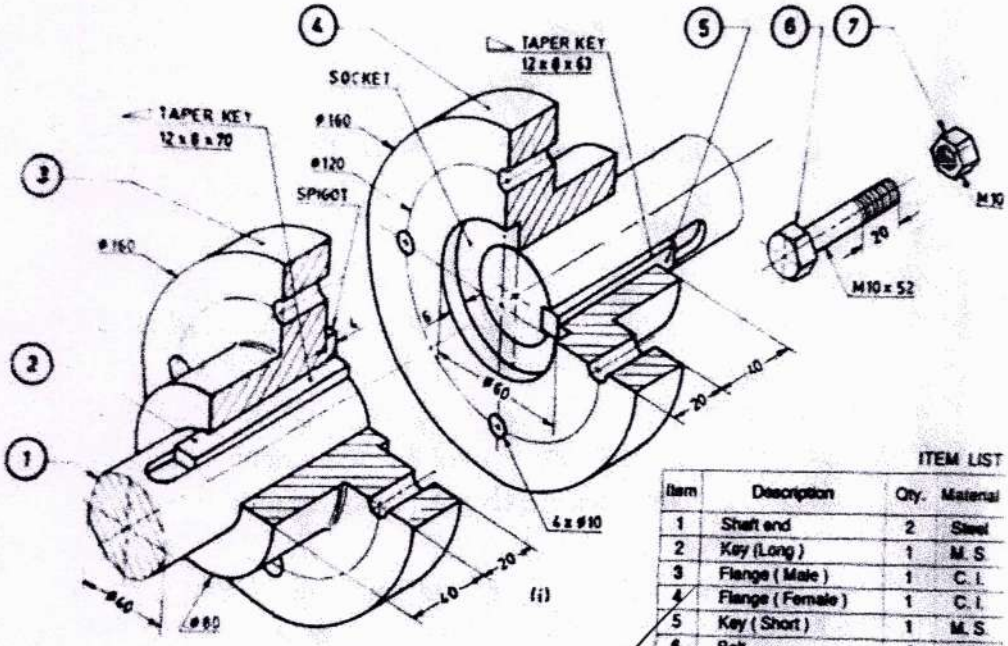
1. A personal computer loaded with any one of the following application Software
   SOLIDWORKS, CATIA, PRO-E

Procedure

1. Execute the application Software ie SOLIDWORKS
2. Set unit "mmgs"
3. Select new part
4. Select Suitable 3D commands (Extrude, revolve, Loft and Sweep)
5. Select the required plan (Top, front and side) and sketch the 2D Profile to be converted ~~to~~ in 3D with required exact dimensions.
6. Exit the 2D sketch and Execute the selected 3D command
7. Repeate the above steps from 4th until the desired Object is completed
8. 3D modifying command are also can be used as and when required (fillet, chamfer, mirror, pattern etc)
9. On completion of 3D modelling, save and close the file and open the new files for each models and model every part in the assembly and save them Seperately with their part name and close all the files.
10. open new assembly and open the base part for the assembly
11. Insert all other parts, the assembly Sequense and make the

Dr. LEENA A.V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:



(i)

ITEM LIST

Item	Description	Qty.	Material
1	Shaft end	2	Steel
2	Key (Long)	1	M. S.
3	Flange (Male)	1	C. I.
4	Flange (Female)	1	C. I.
5	Key (Short)	1	M. S.
6	Bolt	4	M. S.
7	Nut	4	M. S.

Procedure	5
Conduction	5
Result	5
Viva	8.5
Record	5
	28½

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

assembly relationship with the base part or other part inserted using mate command.

12. Save the assembly file with suitable name and close.

13. It is possible to generate 2D drawing of assembly whenever required with 2D drafting module.

HOD ME

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT NO : 5

3D MODELLING AND ASSEMBLING OF KNUCKLE JOINT

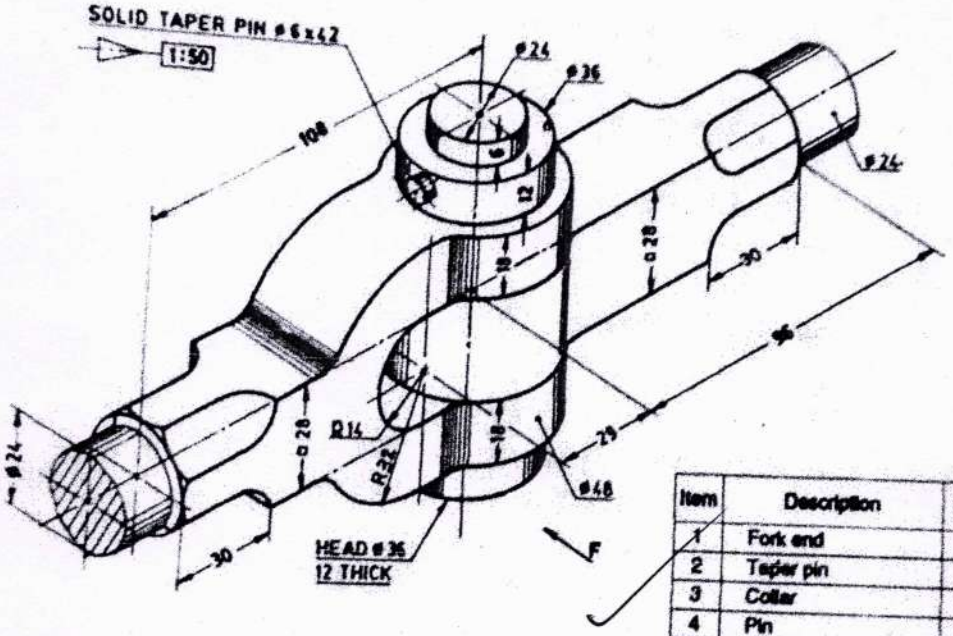
Aim: To familiarize the 3D modelling of various design of objects and to assemble together to form a product having some engineering functions.

Equipments required:

1. A personal computer loaded with any one of the following application softwares.
   SOLIDWORKS, CATIA, PRO-E
2. A3 or A4 Plotter or printer

Procedure:

1. Execute the application software ie SOLIDWORKS
2. Set unit "mmgs"
3. Select new part
4. Select suitable 3D command (Extrude, Revolve, Loft and Sweep)
5. Select the required plan (Top, front, and Side) and sketch the 2D profile to be converted in 3D with required exact dimentions
6. Exit the 2D sketch and Execute the selected 3D command
7. Repeat the above steps from ~~4th~~ 4th until the desired object is completed.
8. 3D modifying commands are also can be used as and when required (fillet, chamfer, mirror, pattern etc)
9. On completion of 3D modelling Save and close the file and open the new files for each models and model every part in the assembly and save Separately with their part name and close all files.



ITEM LIST

Item	Description	Qty.	Material
1	Fork end	1	M. S.
2	Taper pin	1	M. S.
3	Collar	1	M. S.
4	Pin	1	M. S.
5	Eye end	1	M. S.

Procedure	5
Conduction	5
Result	5
Viva	8½
Record	5
	28½

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

10. Open new module of assembly and open the base part for the assembly

11. Insert all other parts as per the assembly sequence and make the assembly relationship with the base part or other parts inserted, using mate command

12. Save the assembly file with suitable ~~name~~ name and close

13. It is possible to generate 2D drawing of assembly whenever required with 2D drafting module.

HOD ME

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT NO: 6

3D MODELLING AND ASSEMBLING OF PLUMMER BLOCK

Aim: To familiarize the 3D modelling of various design of objects and to assemble together to form a product having some engineering functions.

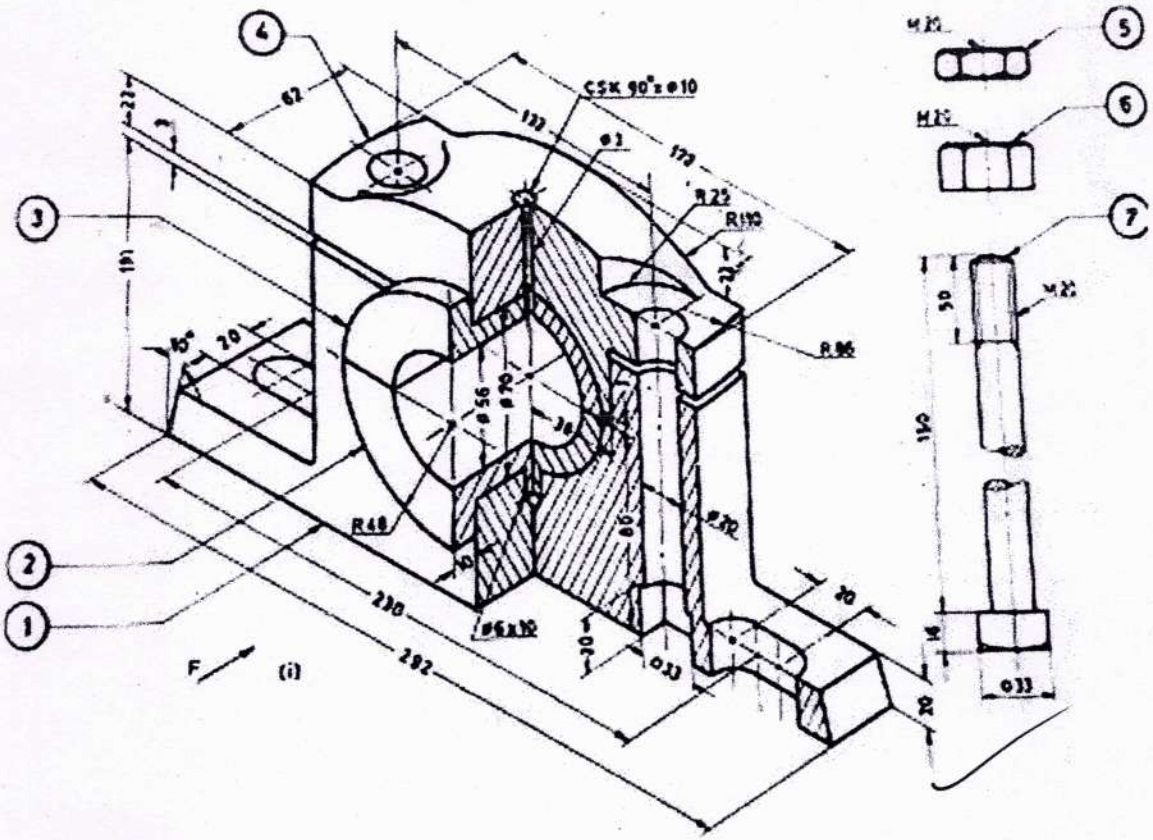
Equipments required:

1. A personal computer loaded with any one of the following application software
   SOLIDWORKS, CATIA, PRO-E
2. A3 or A4 Plotter or Printer.

Procedure:

1. Execute the application software ie SOLIDWORKS
2. Set unit "mmgs"
3. Select new part
4. Select suitable 3D commands [extrude, revolve, Loft and sweep].
5. Select the required plan (Top, front and side) and sketch the 2D profile to be converted in 3D with required exact dimensions.
6. Exit the 2D sketch and execute the selected 3D command
7. Repeat the above steps from 4th until the desired object is completed.
8. 3D modifying commands are also can be used as and when required (fillet, chamfer, mirror, pattern etc)
9. On completion of 3D modelling, save and close the file and open the new file for assembly and model every part in the assembly and save drawing with their part name and close all files.

Teacher's Signature:



Procedure	5
Conduction	5
Result	5
Viva	8½
Record	5

28½

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

10. Open new module of assembly and open the base part for the assembly
11. Insert all other parts as per the assembly sequence and make the assembly relationship with the base part or other parts inserted, using mate command
12. Save the assembly file with suitable name, and close
13. It is possible to generate 2D drawing of assembly whenever required ~~with~~ with 2D drafting module.

HoD ME

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT NO. 7

STRUCTURAL ANALYSIS ON CANTILEVER BEAM

Aim: To familiarize the structural analysis on ANSYS software

Equipment required:

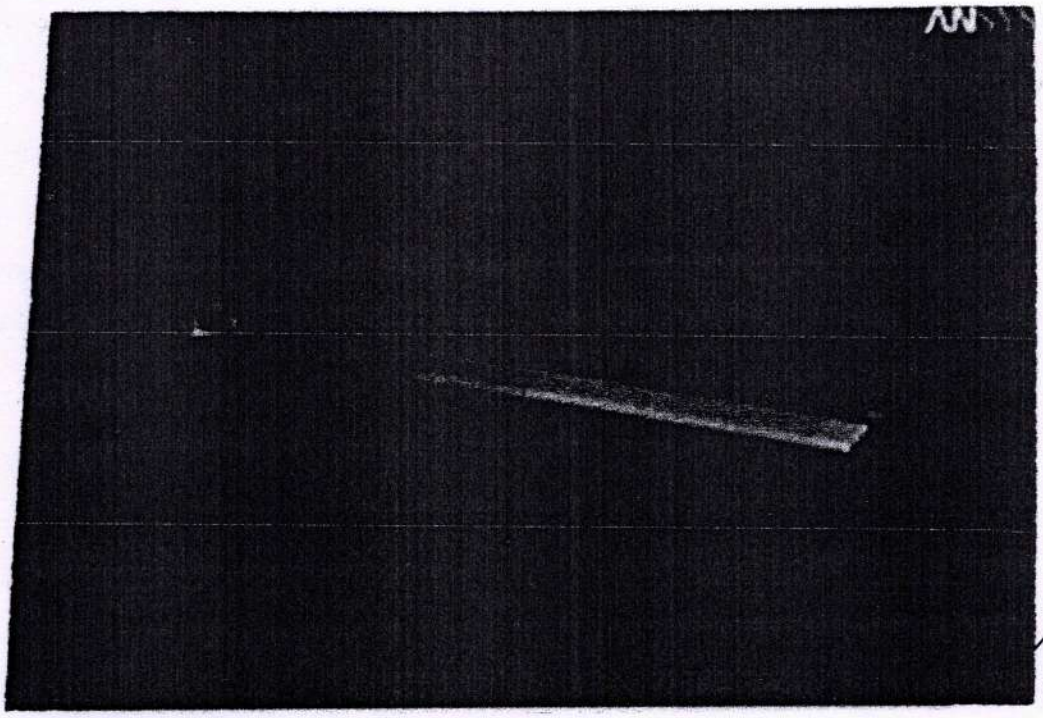
1. A personal computer loaded with any one of the following application Software.
   SOLIDWORKS, ANSYS
2. A4 Printer

PROCEDURE;

1. Execute the application Software ie ANSYS (mechanical APDL)
2. Set preference of study
3. Model the 2D elements to be studied, as per the requirements
4. Set the material type
5. Assign the material properties
6. Create the meshing of the modelled part.
7. Assign the boundary conditions, by applying degree of freedom and external loads at required position
8. Solve problem with given boundary conditions
9. Open the result of deformation, stress and strain plot
10. Generate the report.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:



Procedure	5
Conducti	5
Result	5
va	9½
ord	5

29/2

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD ME

EXPERIMENT NO. 8

STRUCTURAL ANALYSIS ON 2D TRUSS

Aim: To familiarize the structural analysis on ANSYS software.

Equipments required:

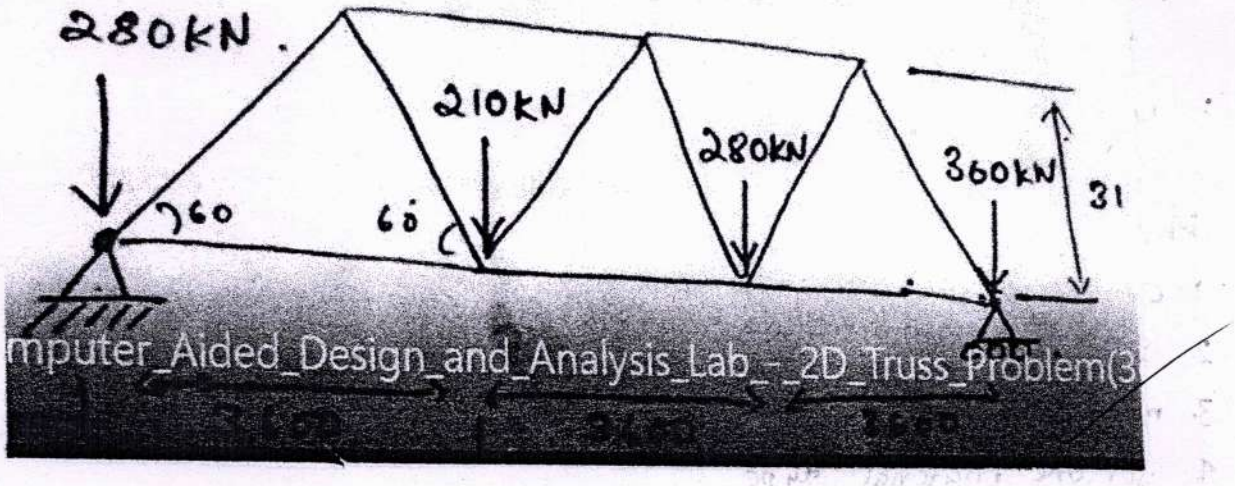
1. A personal computer loaded with any one of the following application Software
   ANSYS
2. A4 Printer.

Procedure:

1. Execute the application Software ie ANSYS (mechanical APDL)
2. Set preference of Study
3. Model the 2D elements to be studied, as per the requirements.
4. Set the material type.
5. Assign the material properties.
6. Create the meshing of the modelled part.
7. Assign the boundary conditions, by applying degree of freedom and external loads at required positions
8. Solve problem with given boundary conditions
9. Open the result of deformation, stress and strain plot
10. Generate the report.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:



Procedure	5
Conduct	5
Result	5
va	9½
ord	5
	29½

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD ME

EXPERIMENT NO. 9

STRUCTURAL ANALYSIS ON 3D PART

Aim :

To familiarize the structural analysis on SOLIDWORKS Software

Equipment required

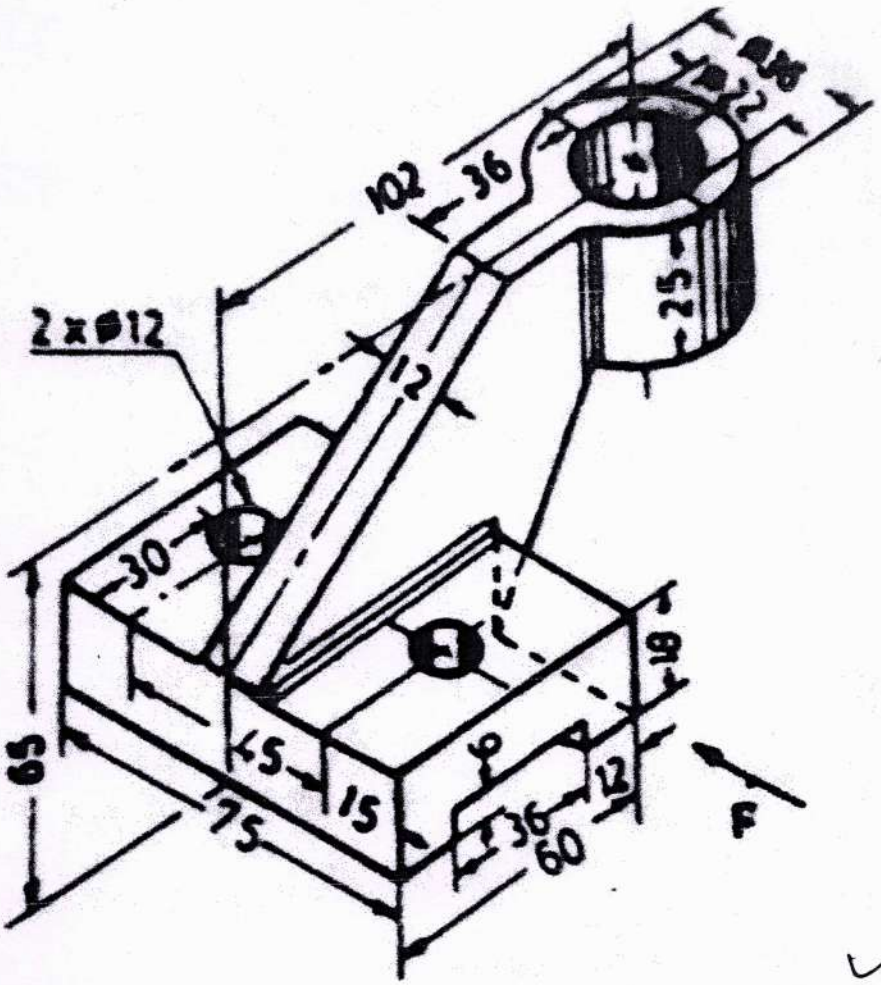
1. A personal computer loaded with any one of the following application Software
   SOLIDWORKS
2. A4 Printer

Procedure:

1. Execute the application software i.e SOLIDWORKS and add in Solidworks Simulation
2. Create new study (Static)
3. Insert the 3D model
4. Set the material type
5. Assign the material properties
6. Assign the boundary conditions, by applying degree of freedom and external loads at required position
7. Create the meshing of the modelled part
8. Solve problem with given boundary conditions
9. Open the result of deformation, stress and strain plot
10. Generate the report.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher Signature



Procedure	5
Conduct	5
Result	5
	9½
	5
	29½

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HoD ME

EXPERIMENT NO. 10

MOTION STUDY OF SCREW AND NUT

Aim: To familiarize the motion study on ~~Solid works soft~~ SOLIDWORKS Software

Equipment required;

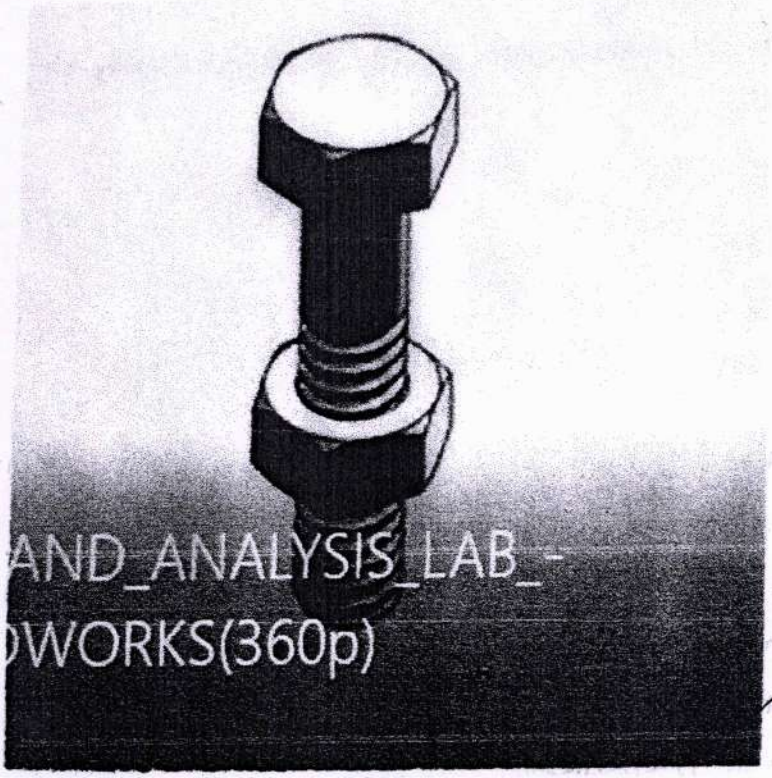
1. A Personal computer loaded with any one of the following application Software
   SOLIDWORKS
2. A4 Printer.

Procedure:

1. Execute the application Software ie SOLIDWORKS and add in Solid work simulations.
2. Create new study (Static)
3. Insert the 3D model
4. Set the material type
5. Assign the material properties
6. Assign the boundary conditions by applying degree of freedom
7. Play the motion study.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:



Procedure	5
Conduction	5
Result	5
Viva	9
Record	5

29

HoD ME

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

EXPERIMENT No. 11

THERMAL PROBLEM ON MIXED BOUNDARY ANALYSIS

Aim :- To familiarize the structural analysis on ANSYS software

Equipments required

1. A personal computer loaded with any one of the following application software.

   SOLIDWORKS, ANSYS

2. A4 Printer.

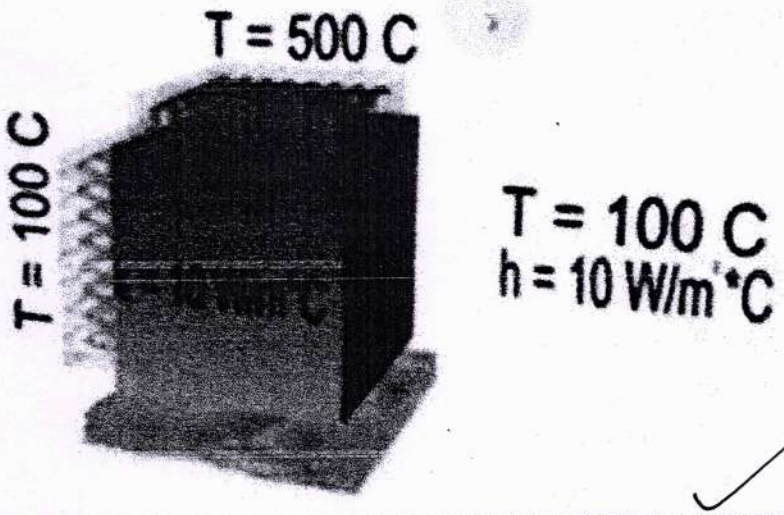
PROCEDURE :

1. Execute the application software ie ANSYS (mechanical APDL)
2. set ~~Pre~~ Preference of Study
3. Model the 2D elements to be studied, as per the requirements
4. Set the material type.
5. Assign the material properties
6. Create the meshing of the modelled part.
7. Assign the boundary conditions.
8. Solve problem with given boundary conditions.
9. Open the result of deformation, stress and strain ~~pro~~ plot.
10. Generate the report.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:

ations. Example is considered as shown in the following figure (Note that the verte



Procedure	5
Conduction	5
Result	5
Viva	8½
Record	5
	28½

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

HOD ME

EXPERIMENT NO : 12
FLUID FLOW ANALYSIS

Aim:

To familiarize the fluid flow analysis of solidworks software

Equipment required:

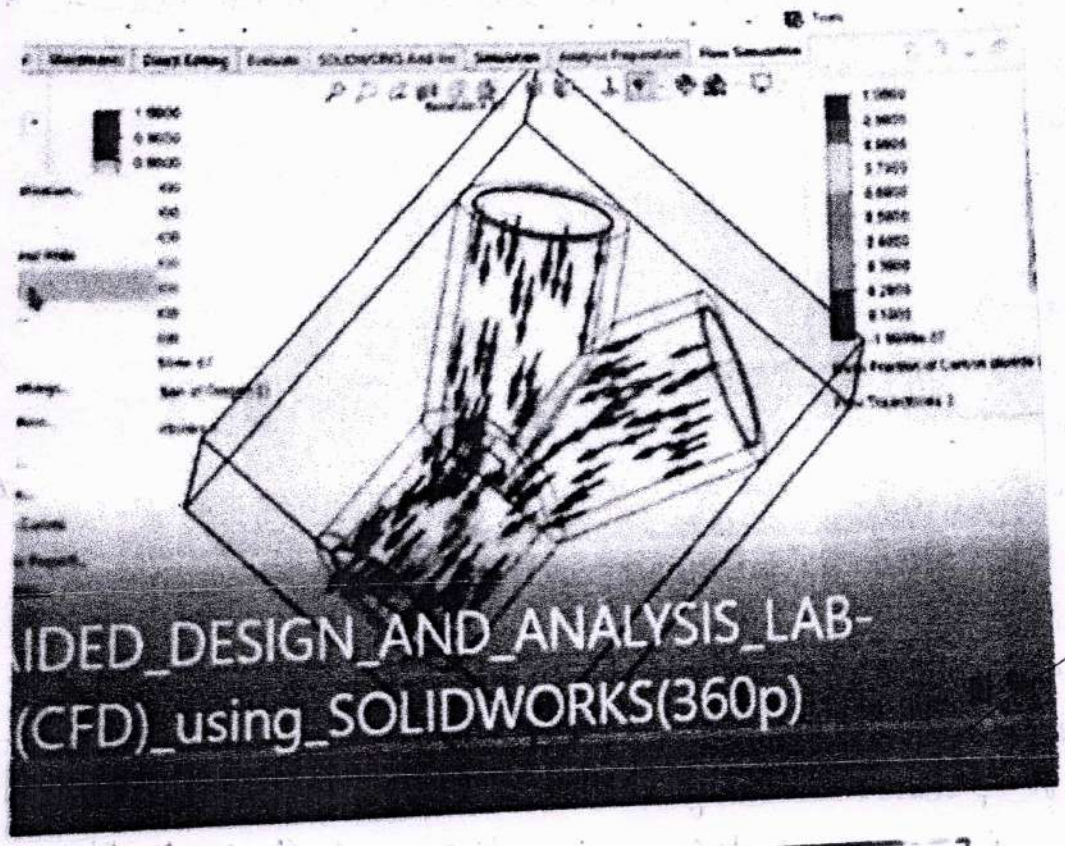
1. A personal computer loaded with any one of the following application software
   SOLIDWORKS
2. A4 printer

Procedure:

1. Execute the application software ie SOLIDWORKS and add in CFD simulation.
2. Create new study (CFD)
3. Insert the 3D model
4. Set the material type
5. Assign the material properties
6. Assign the boundary conditions, by applying degree of freedom
7. Run the CFD
8. View the various results
9. Generate the report.

Dr. LEENA A V
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY
PAYYANUR, KANNUR

Teacher's Signature:



Procedure	5
Conduction	5
Result	5
Viva	9½
Record	5
	29½

Leena

Dr. LEENA A. V.
PRINCIPAL
SREE NARAYANA GURU COLLEGE OF
ENGINEERING & TECHNOLOGY, PAYYANUR
KANNUR

HoD ME