East West University

Department of CSE

LAB REPORT

Course Code and Name: CSE251[Electronic Circuits]		
Experiment no: 04		
Experiment name: Adder and Amplifier Circuit Using 741 Op Amp		
Semester and Year: Fall-24	**GROUP NO: 02**	
Name of Student: 1. Abdul Wadud 2. Ajmain Nur Shihab 3. Nasrullah Kaisher Sijan 4. Md Sabik Hossen **Student Id:** 1. (2022-2-60-133) 2. (2022-3-60-188) 3. (2023-1-60-204) 4. (2023-2-60-305)	**Course Instructor information:** M. Saddam Hossain Khan Senior Lecturer, Department of Computer Science and Engineering, East West University.	
Date of Report Submitted: 18 January 2025	**Pre-Lab Marks:**	
	Post Lab Marks:	
	TOTAL Marks:	

Adder and Amplifier Circuits Using 741 Op Amp

Datasheet:

CSE251 (LAB→04) Group-02

Name: Abdul Wadud ID: 2022-2-60-133

Name: Md. Sabik Hossain ID: 2023-2-60-305

Name: Ajmain Nur Shihab ID: 2022-3-60-188

Name: Nasrullah Kaiser Sizan ID: 2023-1-60-204

Adder circuit:

$R_f = 9.87\,k\Omega$

$R_1 = 9.81\,k\Omega$

$R_2 = 4.65\,k\Omega$

$R_4 = 2.17\,k\Omega$

$V_{out} = -5.01$ Volt

Amplitude = 4.87

Amplifier circuit:

$R_1 = 2.17\,k\Omega$

$R_2 = 9.81\,k\Omega$

$R_A = 2.17\,k\Omega$

$R_B = 9.81\,k\Omega$

$V_A = 1.2$ Volt

$V_B = 0.8$ Volt

$V_C = 0.8$ Volt

$V_D = 3.6$ Volt

$V_{R_1} = 0.8$ Volt

$V_{R_2} = 3.6$ Volt

$V_{R_A} = 1.2$ Volt

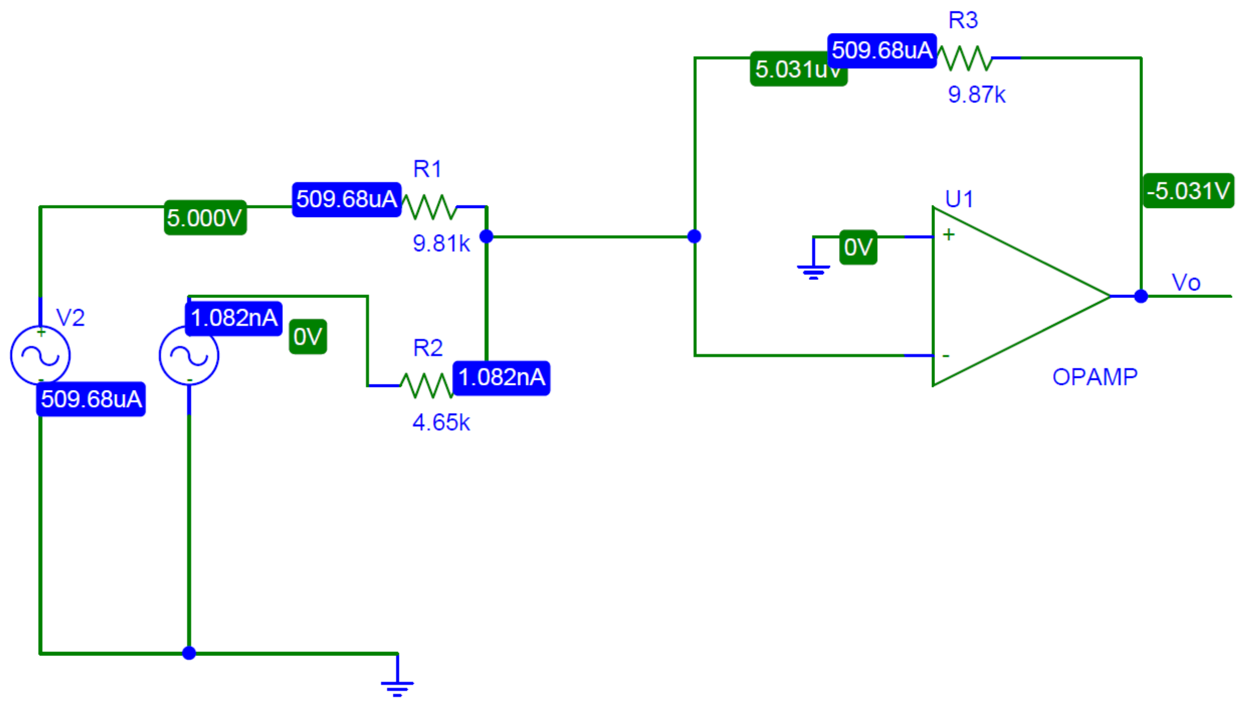
$V_{R_B} = 0.8$ Volt

07/01/25

Objective:

The objective of this experiment is to learn about the 741 Operational Amplifier Integrated Circuit. We also learn to design and construct an adder and an amplifier circuit by using 741 Op Amp.

Circuit Diagram:



Theory And Experimental Methods

The design of adder and amplifier circuits using the 741 operational amplifier involves both theoretical analysis and practical experimentation. Theoretically, the adder circuit is based on the inverting summing amplifier configuration, where the input signals are applied through resistors to the inverting terminal of the op-amp. The output voltage is the weighted sum of the input signals, determined by the ratio of input resistances to the feedback resistor. For the amplifier circuit, configurations such as inverting or non-inverting amplifiers are employed, where the gain is set by the feedback and input resistors' ratio. Experimentally, these circuits are implemented on a breadboard or PCB, and components are selected based on the calculated values. The 741 op-amp is powered with a dual power supply, and connections are carefully made to avoid instability or noise. The circuits are tested by applying input signals and measuring the output with an oscilloscope or multimeter to verify the performance against theoretical predictions. Adjustments are made as needed to optimize functionality and accuracy. This combination of theory and experimentation ensures a robust and reliable design.

Experimental Datasheet:

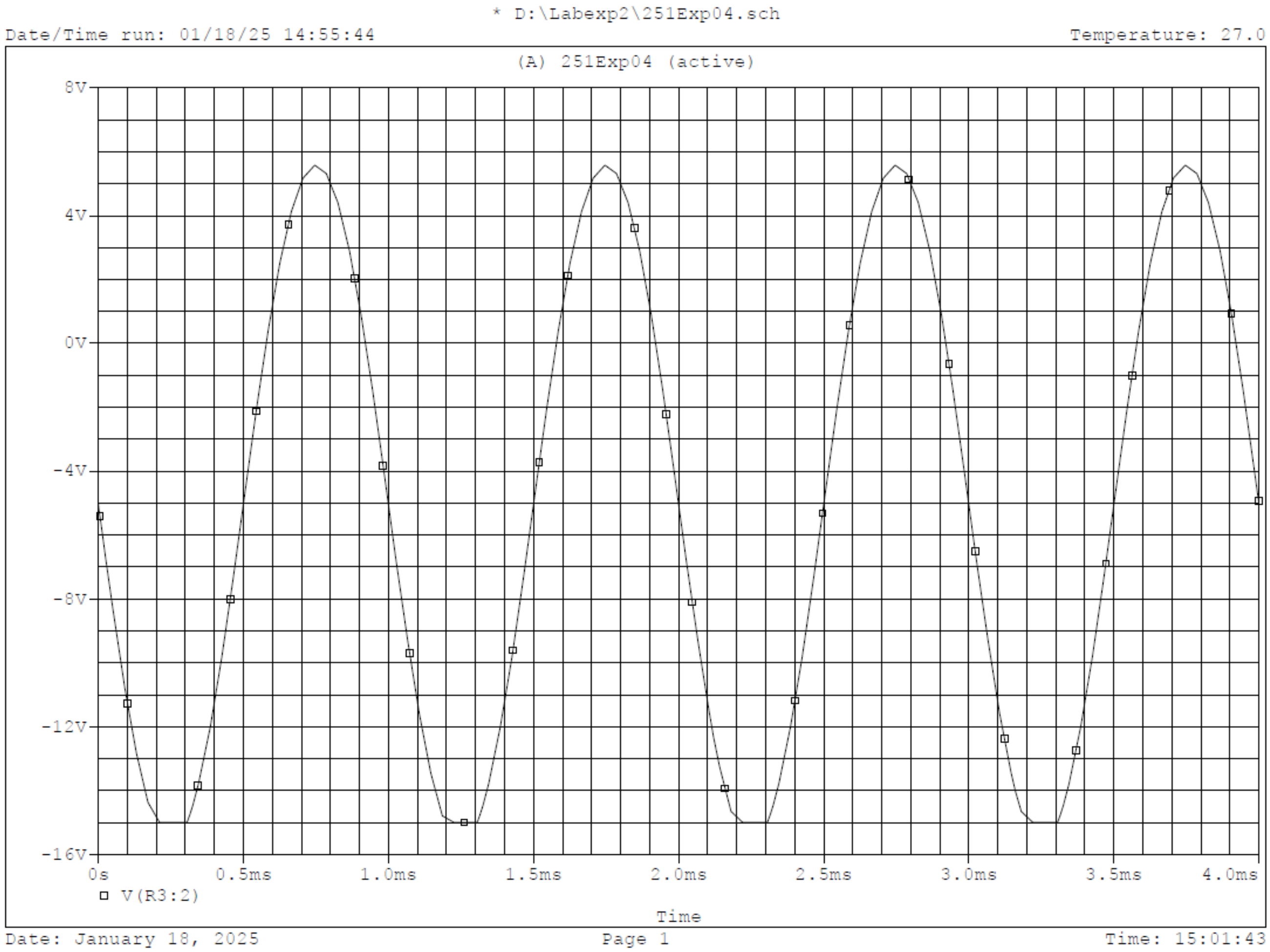
For Adder circuit:
Rf=9.87 k
R1=9.81 k
R2=4.65 k
R4= 2.17 k
Vout = -5.01 V
Amplitude = 4.87
For Amplifier Circuit:
R1=2.17 k
R2=9.81 k
RA=2.17 k
RB= 9.81 k
Va = 1.2V
Vb =0.8 V
Vc =0.8V
Vd= 3.6V
VR1 = 0.8V
VR2= 3.6 V
VRA=1.2V
VRB= 0.8V

Post-Lab Report Questions:

From the experiment we get,

1. Vout= -(Rf*V1/R1 + Rf*V2/R2)
   So, Vout = -9.27 V
   Some technical issue appeared while doing this experiment.
2. Assuming R1=R2,
   Amplitude =5V
   Measured Amplitude = 4.87V
   So the calculated amplitude is higher then the measured amplitude.

3.



4. In Phasor domain, Here,

V1 = 2.5∠0 0V,

V2 = 2.5∠90 0V

V1 + V2 = 2.5∠0 0V + 2.5∠90 0 V

= 3.536 ∠45° V

So, phase angle, φ=45

Vm= √{(2.5)2 + (2.5)2} = 3.536 V

Angle, θ= tan-1 (2.5 / 2.5) = 45°

In time domain we know, Vt = Vm cos (ωt + φ)

Or, Vt= Vm cos (2$\pi f t$ + φ) V

= 3.536 cos (2$\pi f t$ + 45°);

where, f=1kHz=1000Hz

= 3.536 cos (2000πt + 45°)

= 3.536 sin (2000πt + 45° + 90°)

=-3.536 sin (2000πt + 135°)

We know, Time period, T= 1 Ú f= 1 ⁄ 1000= 10−3 s= 1ms
From PSpice simulation, We find amplitude is 5.564V,
Phase angle = 90° And time period = 1ms

	Pspice	Calculation
Amplitude	5.579	5
Phase Angle	90 degree	45 degree
Time Period	1 ms	1 ms

Amplifier circuit:

1. Comparison between measured voltages at nodes A, B, C, and D with pre-lab result:

Node	Measured Voltage	Prelab Voltage
A	1.2	1
B	0.8	0.83
C	0.8	0.83
D	3.6	5

   We can see, the measure voltages from PSpice and pre-lab voltages of node A, B, C, D are almost same.

2. Measured voltage of node,
   B = 0.8V
   C = 0.8 V
   So, VB and VC are almost similar to each other.
3. Here, Voltage in node from pre-lab data is,
   A = 1V
   D = 5V
   Gain = 5V
   Voltage in node from measured data is,
   A = 0.8V
   D = 3.6V
   Gain = 4.5V
   So, the measured voltage gain and pre-lab gain are almost same.
4. Current through,
   I1 = 0.373 mA
   I2 = 0.418 mA
   IA = 0.082 mA
   IB = 0.083mA
   Comparison between measured Values and calculated Values:

Current	Measured current(mA)	Prelab Current(mA)
I1	0.37	0.373
I2	0.46	0.418
IA	0.184	0.082
IB	0.081	0.083

5. Input Impedance: ZI = (VA -VB)/IA = 2.17

Comparison between measured Values and calculated Values:

Impedence	**Measured k ohm**	**Prelab k ohm**
Z1	**2.17**	**2.2**

Name: Ajmain Nur Shihab ID: 2022-3-60-188

East West University

Exp Name: (4) Adder and Amplifier
Using 741 op Amp

Name: Ajmain Nur Shihab

ID: 2022-3-60-188

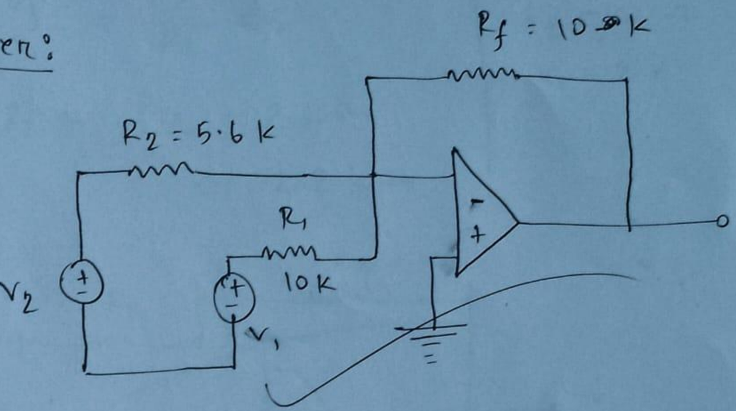
Section: 7

Course: CSE 251

Instructor: M Saddam Hossain Khan

Ans to the ques no: 1

Adder:



Let, $R_f = 10k\Omega$

Given, $V_o = -(V_1 + 2V_1)$

and, $\frac{R_f}{R_2} = 2$ or, $R_1 = \frac{10K}{2} = 5k\Omega$

As there is no $5\,k\Omega$ resistor, so, we take. $5.6\,k\Omega$.

Again, $\frac{R_f}{R_1} = 1$ or, $R_f = R_1$

$\therefore R_1 = 10k\Omega$

$\therefore R_f = 10\,k\Omega$

$R_1 = 10\,k\Omega$

$R_2 = 5.6\,k\Omega$

Given,

<u>Ans to the ques no: 2</u>

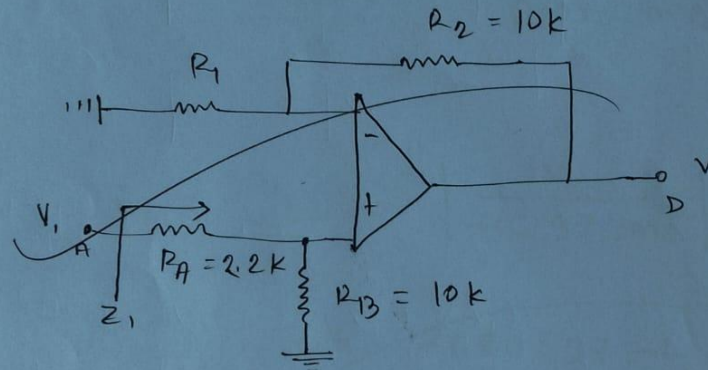
$$\frac{V_2}{V_1} = \frac{R_2}{R_1} = 5$$

$$\Rightarrow R_1 = \frac{R_2}{5} = 2\,k\Omega$$

$$\approx 2.2\,k\Omega$$

$R_2 = 10k\Omega$

$V_1 = 2\,V$



VDR at node A,

$$V_B = \frac{R_1}{R_1 + R_2} \cdot V_1$$

$$= \frac{10K}{10K + 2.2K} \times 1$$

$$= 0.82\,V$$

$$V_C = V_B = 0.82\,V$$

$$V_D = D V_0 = 5 V_1 = 5$$

$$I_1 = \frac{0 - 0.82}{2.2k} = -0.373\,mA$$

$$I_2 = \frac{0.82 - 5}{10K} = -0.418\,mA$$

$$I_A = \frac{1 - 0.82}{2.2k} = 0.082\,mA$$

$$I_B = \frac{0.82 - 0}{10k} = 0.082\,mA$$

$$\therefore Z_1 = \frac{V_1}{I_1} = \left|\frac{1V}{-0.373mA}\right|$$

$$= 2680.97\,\Omega$$

$$= 2.7\,k\Omega$$

Name: Sabik Ahmed Niloy   ID: 2023-2-60-305

East West University

Department of CSE

Course : CSE251 (Electronic circuit)

Expt No: 04

Title: Adder and Amplifier circuit using 741 OpAmp

Submitted To:

SHK

Submitted By:

Md. Sabik Hossen

2023-2-60-305

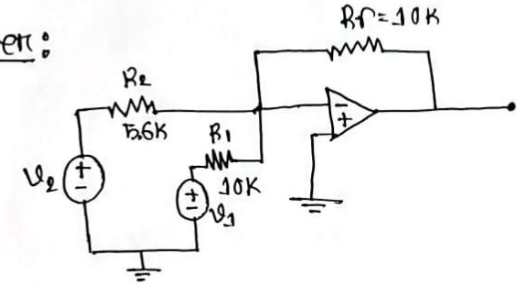
Section: 07

Date of submission

31-12-24

Ans to the Question 01

Adder:



Let, $R_f = 10\ k\Omega$

Given, $v_0 = -(v_1 + 2v_2)$

$R_f/R_2 = 2$ or $R_1 = \frac{10K}{2} = 5\ k\Omega$

As there is no $5\ k\Omega$ Resistor, so we take $5.6\ k\Omega$.

Again, $R_f/R_1 = 1$ or $R_f = R_i$

$\therefore R_i = 10\ k\Omega$

$\therefore R_f = 10\ k\Omega$

$R_1 = 10\ k\Omega$

$R_2 = 5.6\ k\Omega$

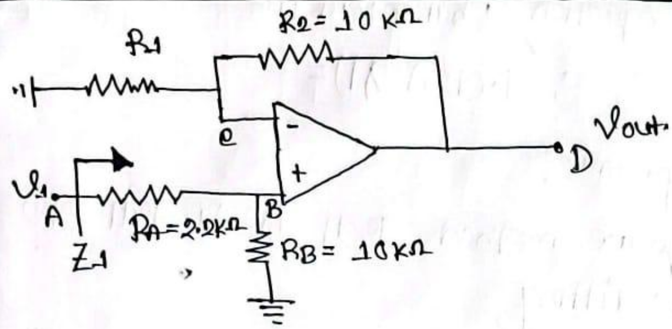
Ans to the Question no. 02

Given, $\frac{v_0}{v_1} = \frac{R_2}{R_1} = 5$

$\Rightarrow R_1 = R_2/5 = 2\ k\Omega \approx 2.2\ k\Omega$

$R_2 = 10\ k\Omega$

$v_1 = 1\ V$



Applying VDR at node A,

$$V_B = \frac{R}{R_1+R_2} \cdot V_1$$

$$= \frac{10\,k\Omega}{10\,k\Omega + 2.2\,k\Omega} \times 1$$

$$= 0.82\,V$$

$$V_C = V_B = 0.82\,V$$

$$V_D = V_0 = 5V_1 = 5$$

$$I_1 = \frac{0 - 0.82}{2.2} = -0.373\text{ mA}$$

$$I_2 = \frac{0.82 - 5}{10} = -0.418\text{mA}$$

$$I_A = \frac{1 - 0.82}{2.2} = 0.082\text{ mA}$$

$$I_B = \frac{0.82 - 0}{10} = 0.082\text{ mA}$$

$$\therefore Z_1 = \frac{V_1}{I_1} = \left| \frac{1\,V}{-0.373\text{mA}} \right|$$

$$= 2680.97\,\Omega / 1000$$

$$= 2.7\,k\Omega$$

Name: Abdul Wadud Priyo ID: 2022-2-60-133

EAST WEST UNIVERSITY
Department of CSE
Courses Title: Electronic Circuit.

Courses Code: CSE251

Pre Lab: 04

Title: Adder and Amplifier Circuit by using 741 Op-Amp

Submitted by:

Name: Abdul Wadud
ID: 2022-2-60-133

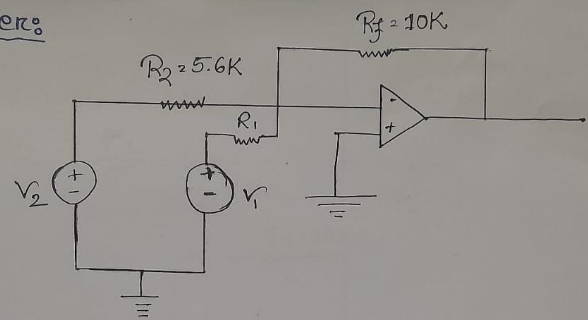
Submitted to:

Name: Mr. Saddam Hossain Khan (SHK)
~~Le~~ Senior Lecturer
Department of CSE.

Submission Date: 31|12|2024

Answer to the Question no ⇒ 01

Adder:



Let, $R_f = 10\,K\Omega$

Given, $V_0 = -(V_1 + 2V_1)$

and $\frac{R_f}{R_2} = 2$ or, $R_1 = \frac{10K}{2} = 5\,K\Omega$

As there is no $5\,K\Omega$ resistor, so we take $5.6\,k\Omega$.

Again, $\frac{R_f}{R_1} = 1$ or, $R_f = R_1 \therefore R_1 = 10\,k\Omega$

$R_f = 10\,k\Omega$

$R_1 = 10\,K\Omega$

$R_2 = 5.6\,k\Omega$

Answer to the Question no:02

Given,

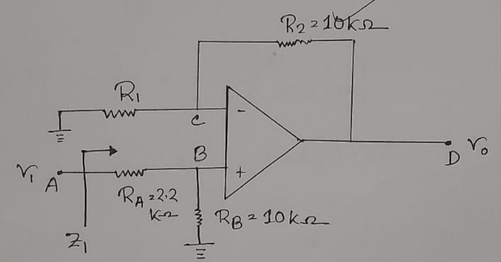
$$\frac{V_0}{V_i} = \frac{R_2}{R_1} = 5$$

$R_1 = 10k\Omega$

$V_i = 1$ Volt

$$\Rightarrow R_1 = \frac{R_2}{5} = 2k\Omega$$

$$\approx 2.2k\Omega$$



VDR at node A,

$$V_B = \frac{R_1}{R_1 + R_2} \times V_1$$

$$= \frac{10}{10 + 2.2} \times 1$$

$$= 0.82 \text{ Volt}$$

$V_C = V_B = 0.82$ Volt

$V_D = V_0 = 5 \quad V_i = 5$ Volt

$$I_1 = \frac{0 - 0.82}{2.2} = 0.373\,mA$$

$$I_2 = \frac{0.82 - 5}{10} = -0.418\,mA$$

$$I_A = \frac{1 - 0.82}{2.2} = 0.082\,mA$$

$$I_B = \frac{0.82 - 0}{10} = 0.082\,mA$$

$$Z_1 = \frac{V_1}{I_1} = \left| \frac{1V}{-0.373\,mA} \right|$$

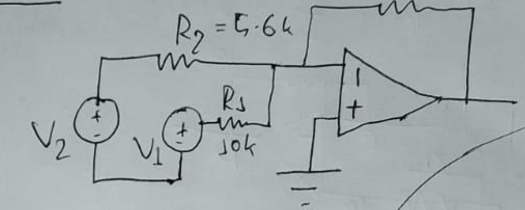
$$\cancel{= 2.6} = 2680.97\,\Omega$$

$$= 2.7\,k\Omega$$

Name: Nasrullah Kaisher Sijan ID: 2023-1-60-204

Ans. The Que. No. 1

Adder:



Let, $R_f = 10k\Omega$

Given, $V_o = -(V_1 + 2V_2)$

and $\frac{R_f}{R_2} = 2$ or, $R_1 = \frac{10k}{2} = 5k\Omega$

As there is no 5k resistor, So we take 5.6 $k\Omega$

Again, $\frac{R_f}{R_1} = 1$ or $R_f = R_1$ $\therefore R_1 = 10k\Omega$

$\therefore R_f = 10k\Omega$

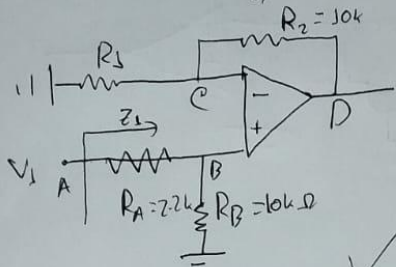
$R_1 = 10k\Omega$

$R_2 = 5.6k\Omega$

Ans. The Que. No. 2

Given, $\frac{V_o}{V_1} = \frac{R_2}{R_1} = 5$ | $R_2 = 10k\Omega$, $V_1 = 1V$

$\therefore R_1 = \frac{R_2}{5} = 2k\Omega$



VDR at node A,

$$V_B = \frac{R_1}{R_1 + R_2} V_1 = \frac{10k}{10k + 2.2k} \times 1$$
$$= 0.82V$$

$\therefore V_C = V_B = 0.82V$

$V_D = V_o = 5V$

$$\therefore I_1 = \frac{0.82}{2.2k} = 0.373mA$$

$$I_2 = \frac{0.82-5}{10k} = -0.418mA$$

$$I_A = \frac{1-0.82}{2.2k} = 0.082mA$$

$$I_B = \frac{0.82-0}{10k} = 0.083mA$$

$$\therefore Z_1 = \frac{V_1}{I_1} = \left| \frac{1}{-0.373mA} \right| = 2.7k\Omega$$