Name: **Enrolment No:**	

UPES

End Semester Examination, December 2023

Course: Analog Systems and Applications **Semester : III**

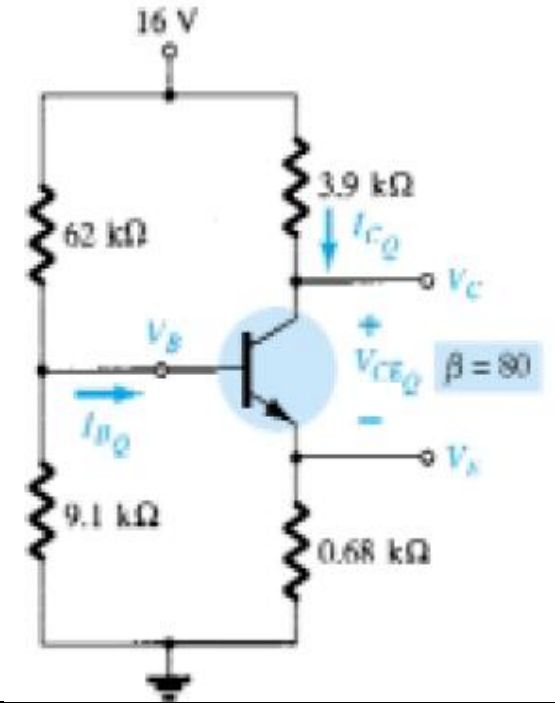
Program: B. Sc (Honors) Physics **Time : 03 hrs.**

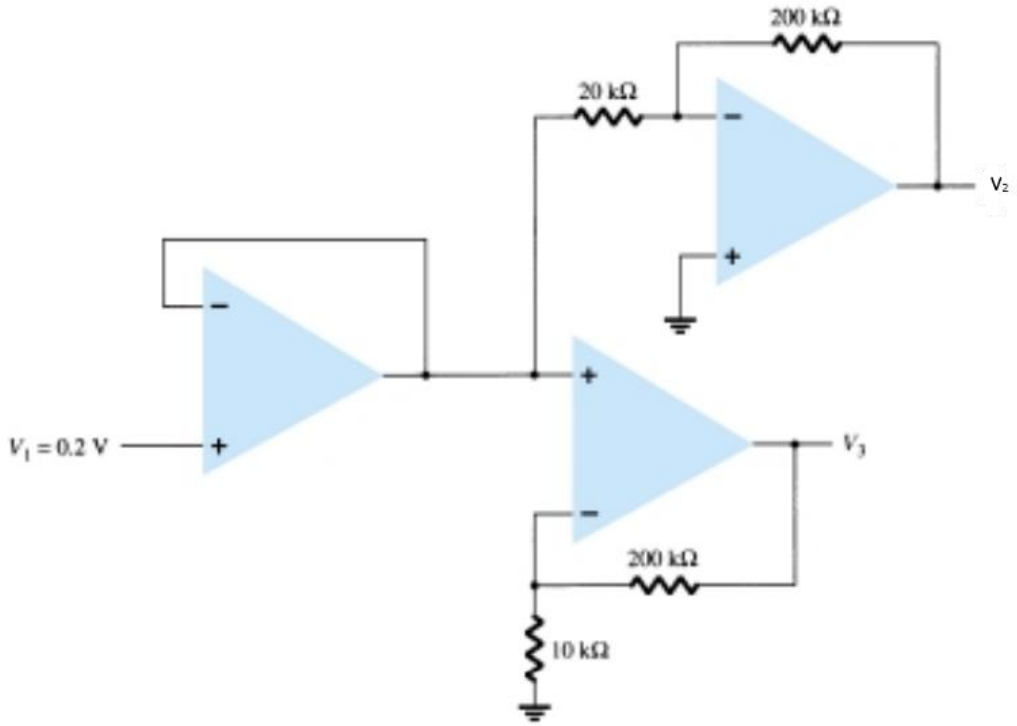
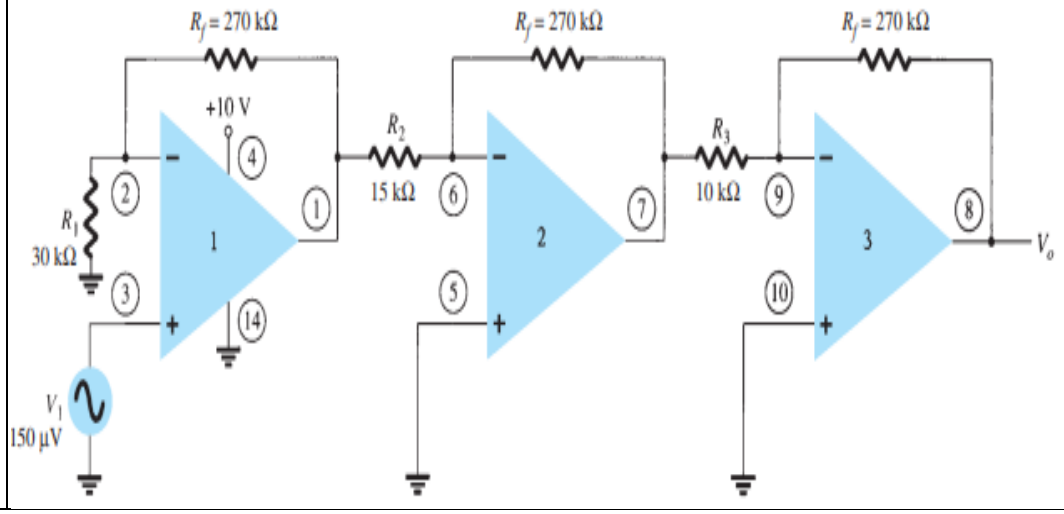
Course Code: PHYS 2025 **Max. Marks: 100**

Instructions: All the questions are compulsory from section A & B. In section-C, Q 10 is compulsory while attempt any one out of Q 11 and Q 12.

SECTION A

S. No.		**Marks**	**CO**
Q 1	Draw the volt-ampere characteristics of a Zener diode. What is meant by Zener breakdown?	**4**	**CO1**
Q 2	Input and output voltage measurements of V_i = 10 mV and V_o = 25 V are made. What is the voltage gain in decibels?	**4**	**CO1**
Q 3	A transistor with α=0.98 and I_{CBO}= 5μA is biased so that I_{BQ} = 100μA. Find I_{CQ}, and I_{EQ}.	**4**	**CO1**
Q 4	Define the lower cutoff frequency, upper cutoff frequency, and bandwidth of a voltage amplifier.	**4**	**CO1**
Q 5	List the advantages and disadvantages of negative feedback in the amplifier.	**4**	**CO1**
	SECTION B		
Q 6	(a) Draw the circuit of a half wave rectifier circuit with capacitor filter. Draw the output voltage with and without load and explain qualitatively. (b) Show that the ripple factor of full wave rectifier (without filter) circuit is 1.21	**10**	**CO2**
Q 7	(a) Determine I_C and V_{CE} for the network of the figure given below (b) Change β to 120 (50% increase) and determine the new values of I_C and V_{CE} for the network of Fig. (c) Determine the magnitude of the present change in I_C and V_{CE} using the following equation	**10**	**CO2**

	$\%\Delta I_C = \left\lvert \frac{I_{C(\text{part a})} - I_{C\ (\text{part b})}}{I_{C\ (\text{part a})}} \right\rvert \times 100$ $\%\Delta V_{CE} = \left\lvert \frac{V_{CE(\text{part a})} - V_{CE\ (\text{part b})}}{V_{CE\ (\text{part a})}} \right\rvert \times 100$ 		
Q 8	Explain the concept of virtual ground in the analysis of OP AMP. Derive the expression of voltage gain in case of non-inverting operational amplifier.	**10**	**CO2**
Q 9	Draw a family of input and output characteristics of common base configuration of BJT. Explain the shape of these curves qualitatively.	**10**	**CO2**
SECTION-C **Attempt any one out of Q11 and Q12**			
Q 10	Draw the hybrid equivalent model of BJT. Give the physical significance of each hybrid-parameter involved in the equivalent circuit. Derive an analytical expression for the input impedance, Z_i current gain, A_I, voltage gain, A_V, and output impedance, Z_o in terms of these parameters.	**20**	**CO3**
Q 11	(a) Determine the output voltage of an op-amp for input voltages of V_{i1} = 150 µV, V_{i2} = 140 µV. The amplifier has a differential gain of Ad = 4000 and the value of CMRR is: (a) 100. (b) $10^{5.}$	**10**	**CO3**

	(b) Analyze the circuit given below and find out the voltage V_2 and V_3. 	**10**	**CO3**
Q 12	(a) Draw the circuit of a differentiator and explain its operation by deriving its transfer function and referring to the input and output waveforms.	**10**	**CO3**
	(b) Analyze the following circuit and find out the output voltage. 	**10**	**CO3**