Total number of printed pages: **03** **Programme(UG)/4th Semester/UIE401**

2025

ANALOG INTEGRATED CIRCUITS

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) Calculate the single-ended output voltage V_{o1} and Common mode gain for the circuit of Fig.1. 10

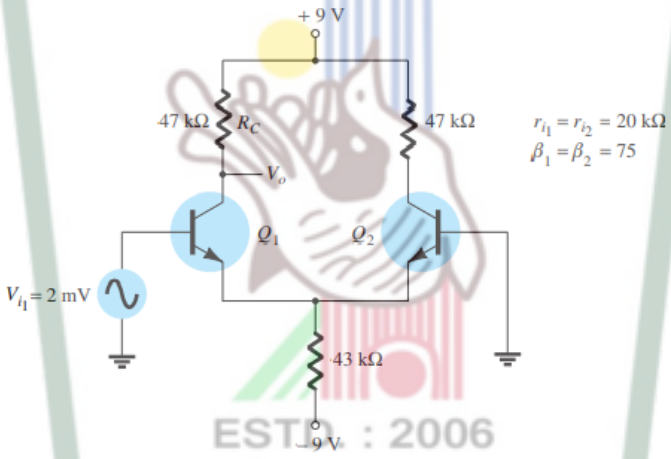

Fig.1

b) Determine the output of an inverting amplifier and a non-inverting amplifier if R_1=100KΩ, R_f=500 KΩ, and V_1=2V. 5

c) Calculate the output voltage of an op-amp summing amplifier for the following sets of voltages and resistors. Use R_f = 1 MΩ in all cases. 5

i. V_1 = +1 V, V_2 = +2 V, V_3 = +3 V, R_1 = 500 KΩ, R_2 = 1 MΩ, R_3 = 1 MΩ.

ii. V_1 = -2 V, V_2 = +3 V, V_3 = +1 V, R_1 = 200 KΩ, R_2 = 500 KΩ, R_3 = 1 MΩ.

2. a) Derive the output of Integrator and Differentiator using OpAmp. 10

b) Determine the output voltage of the circuit of Fig. 3. 5

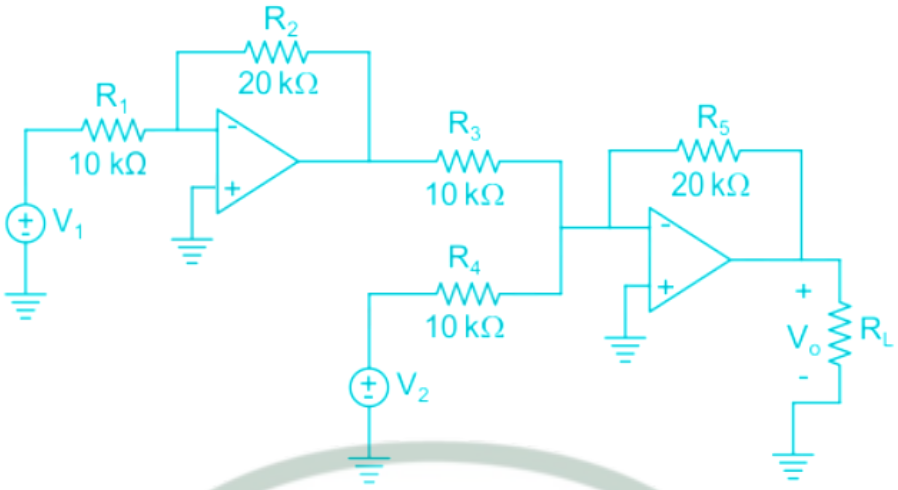

Fig. 3

c) An ideal Op-Amp circuit shown below, R_1=3kΩ, R_2=1kΩ and V_i=0.5sinωt. Determine the potential at point P and amplitude of V_o. 5

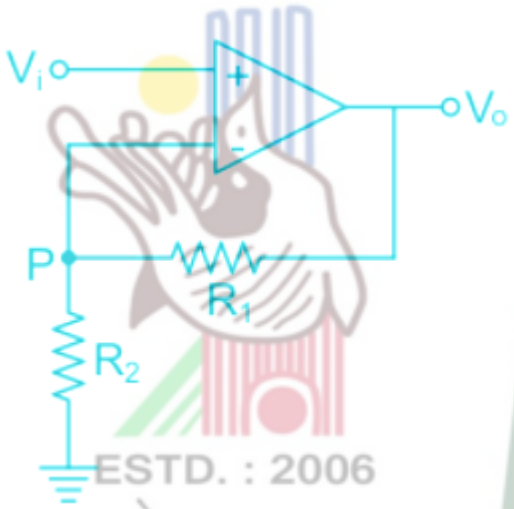

Fig.4

3. a) Derive the expression for Output offset voltage of an OpAmp due to Input offset Voltage and Input Offset Current. 10

b) Draw and explain the circuits for amplifying the product of two voltages. 5

c) Determine the output voltage of an op-amp for input voltages of V_{i1} = 200 mV and V_{i2} = 100 mV. The amplifier has a differential gain of A_d =4000 and the value of CMRR is: 5
i. 150.
ii. 10000 .

4. a) Derive the output of log and antilog amplifier. 10

b) Determine overall voltage gain of the circuit shown in fig. 5 5

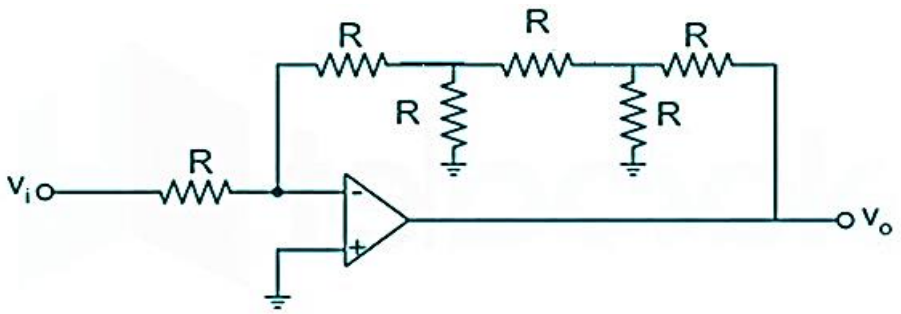

Fig.3

c) What is Schmitt trigger? For the operational amplifier circuit shown, the output saturation voltages are $\pm 15V$. The upper and lower threshold voltages for the circuit are, respectively. 5

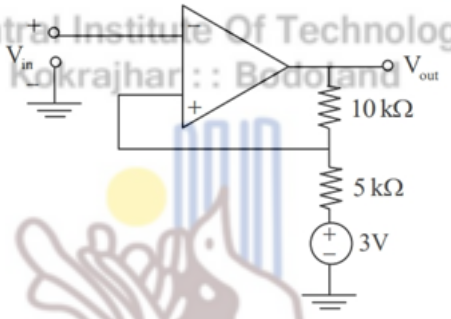

Fig. 6

5. a) What is a multivibrator? Explain an astable and a monostable multivibrator with OPAmp. 10

b) Explain the working of monostable multivibrator using NE555 timer. 10

6. Write short notes on any two of the following 10x2=20

a) Wein Bridge Oscillator

b) Phase Shift Oscillator

c) PLL