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

2024

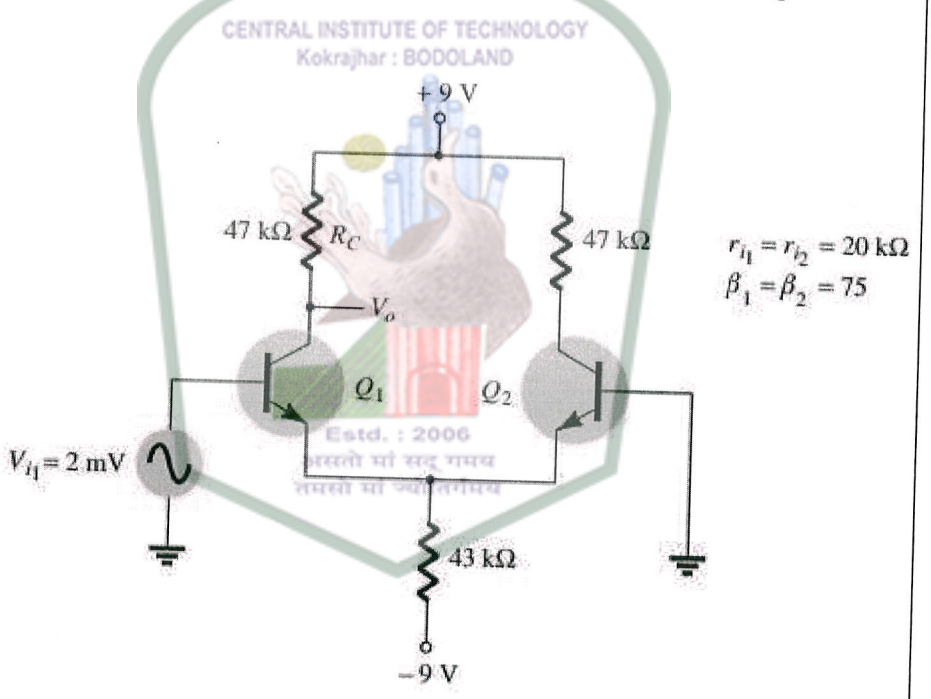
ANALOG INTEGRATED CIRCUITS

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} for the circuit of Fig. 1.  Fig.1	6
	b)	Derive the expressions for gains of OPAmp based inverting and non-inverting amplifier.	10
	c)	A non-inverting operational summing amplifier is shown in fig. 2 Find V_o	4

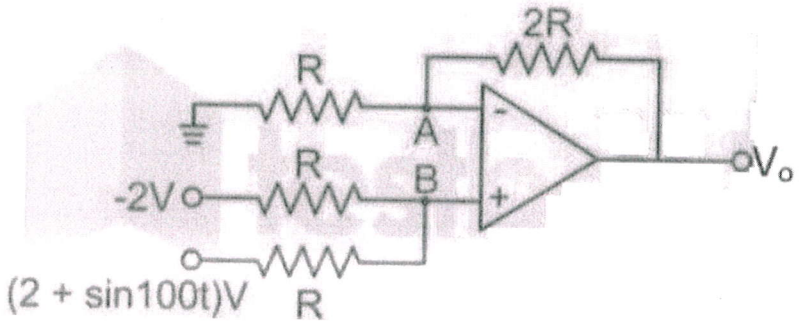


Fig.2

2.	a)	What are the different types of controlled sources using OpAmp. Explain each type.	10
	b)	In the circuit shown the saturation voltage ±15V and the input voltage is -3.5V. Find the output voltage.	5
	c)	For the operational amplifier circuit shown, the output saturation voltages are ±15*V*. The upper and lower threshold voltages for the circuit are, respectively.	5
3.	a)	In the circuit of Fig. 5 assume that the OpAmp is ideal. If the gain V_o/V_{in} is	5

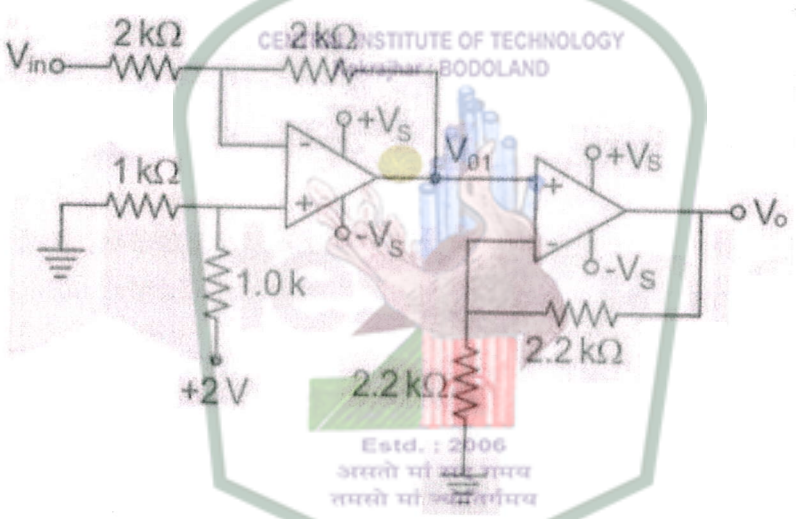


Fig. 3

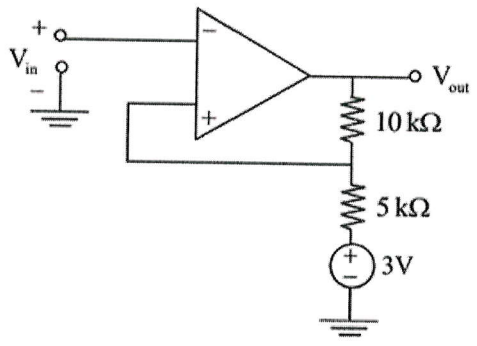
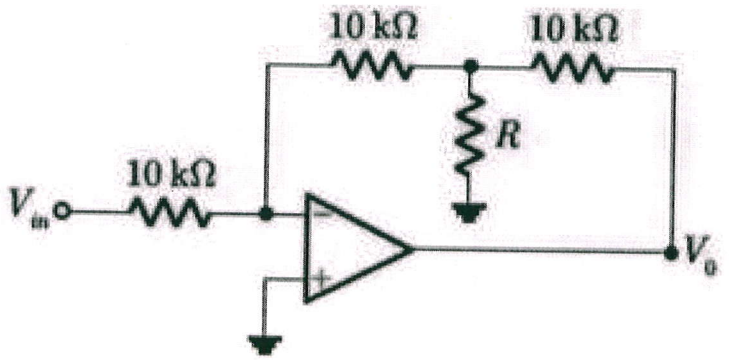


Fig. 4

		-12 determine the value of R in kΩ.  Fig. 5	
	b)	Calculate the output voltage of an op-amp summing amplifier for the following sets of voltages and resistors. Use $R_f = 1$ M in all cases. a. $V_1 = +1$ V, $V_2 = +2$ V, $V_3 = +3$ V, $R_1 = 500$ k, $R_2 = 1$ M, $R_3 = 1$ M. b. $V_1 = -2$ V, $V_2 = +3$ V, $V_3 = +1$ V, $R_1 = 200$ k, $R_2 = 500$ k, $R_3 = 1$ M	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: i. 150. ii. 10000 .	6
	d)	What is precision rectifier ? Explain.	4
4.	a)	Derive the output of log and antilog amplifier.	10
	b)	Derive the expression for output voltage of an OpAmp in terms of A_d, V_d, V_c and CMRR.	10
5.	a)	Draw and explain the circuits for amplifying the product and ratio of two voltages.	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)	Schmitt Trigger	
	b)	Phase Shift Oscillator	
	c)	PLL	
	d)	Instrumentation Amplifier	