Total number of printed pages = 4

19/4th Sem/UIE 401

2022

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. 6

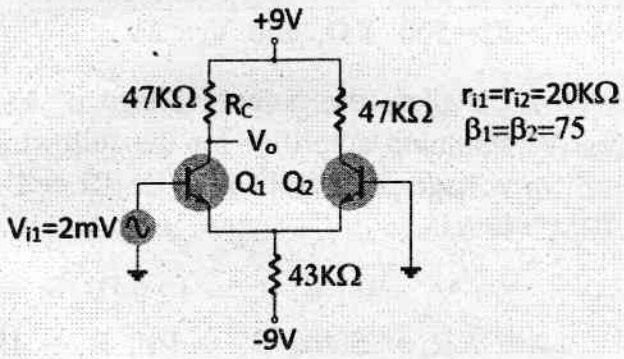

Fig.1

[Turn over

(b) Draw the AC and ideal equivalent circuit of an Op Amp as a constant gain multiplier. Also derive the expression for gain. 4+6=10

(c) Calculate the DC voltages and currents in the circuit of Fig. 2. 4

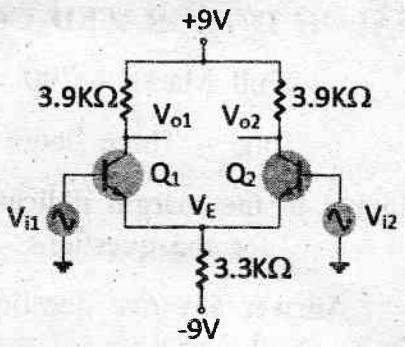

Fig. 2

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

(b) Calculate the output voltage of an Op-amp summing amplifier for the following sets of voltages and resistors. Use Rf = 1 M in all cases.

(a) $V_1 = +1V$, $V_2 = +2V$, $V_3 = +3V$,
$R_1 = 500k$, $R_2 = 1M$, $R_3 = 1M$.

(b) $V_1 = -2V$, $V_2 = +3V$, $V_3 = +1V$,
$R_1 = 200k$, $R_2 = 500k$, $R_3 = 1M$. 5

(c) Derive the expression for Output offset voltage of an Op Amp due to Input offset Voltage and Input Offset Current. 10

3. (a) Determine the output voltage for the circuit of Fig. 3 with a sinusoidal input of 2.5 mV. 5

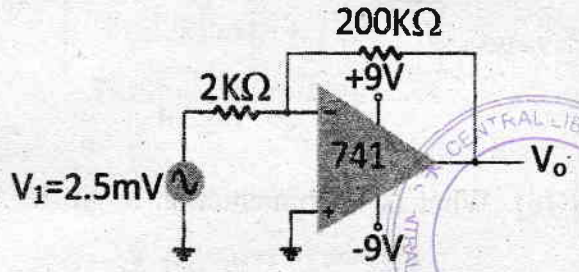

Fig. 3

(b) Derive expressions for output voltage of an integrator and a differentiator using Op Amp. 10

(c) Determine the output voltage of an Op-amp for input voltages of V_{i1} = 150 mV and V_{i2} = 140 mV. The amplifier has a differential gain of A_d 4000 and the value of CMRR is :

(i) 100. (ii) 10^5. 5

4. (a) Derive the expression for output voltage of an OpAmp in terms of A_d, V_d, V_c and CMRR. 10

(b) Determine the output voltage of the circuit of Fig. 4 6

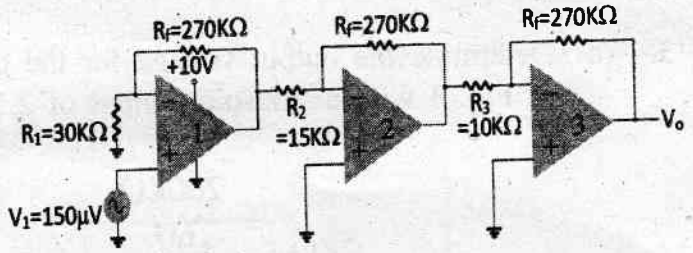

Fig. 4

(c) What is instrumentation amplifier ? Explain. 4

5. (a) What are the different types of controlled sources using OpAmp. Explain each type. 10

(b) Explain the working of a monostable multivibrator using NE555 timer. 5

(c) How square wave can be generated ? Explain. 5

6. Write short notes on any *two* of the following : 10×2=20

(a) Phase shift oscillators

(b) Phase locked loop (PLL)

(c) Log and Antilog amplifier using OpAmp.