Reg. No.											

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

IV SEMESTER B.Tech (BME) DEGREE END SEM EXAMINATIONS, APR/MAY 2019.

SUBJECT: INTEGRATED CIRCUIT SYSTEMS (BME 2202)
(REVISED CREDIT SYSTEM)
Friday, 26th April, 2019, 2 PM to 5 PM

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to Candidates:

1. **Answer ALL questions.**
2. **Draw neat labeled diagrams wherever necessary.**

1A) Draw the circuit using Op-Amp. to obtain the expression 2+1

$V_o = \frac{V_1 + V_2 + V_3}{3}$. Justify your answer.

How this circuit can be modified to obtain the expression $V_o = 2 \times [V_1 + V_2 + V_3]$

1B) Draw the circuit of voltage to current converter with grounded load using Op-Amp. Derive the expression of the load current. 3

1C) For the circuit shown in Fig.Q1C, derive the expression 4

$$V_o = \frac{-A_v R_i \left(R + R^1\right) V_{io}}{RR^1 + \left(R_i + R_1\right)\left(R + R^1\right) - RR_i A_v}$$

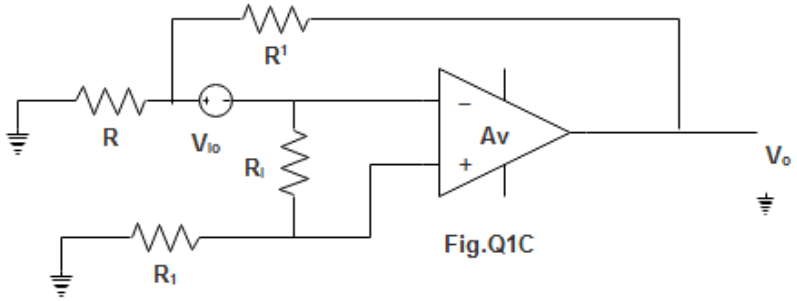

Fig.Q1C

2A) Draw the circuit of an instrumentation amplifier suitable for bridge type transducer. Explain its operation and obtain the expression of the output. 3

2B) Draw the circuit of a positive edge triggered mono-stable multi-vibrator using Op-Amp. Draw the corresponding waveforms across the capacitor C and output of the Op-Amp. Derive the expression of the pulse width t_p. Design the values of the components of the circuit to obtain the pulse width of 2 msec. Consider β=0.5, forward voltage of the diode is 0.6 Volts and $V_Z = 5.5$ Volts. 4

2C) Design an inverting Schmitt trigger circuit using Op-Amp for the following specifications. 3

$UTP = 2$ Volts, LTP $= -3$ Volts, $V_{CC} = \pm 14$ Volts.

3A) Design and draw the circuit of a 3rd order band pass Butterworth filter to pass the signals of frequencies from 200 Hz to 20 KHz. The overall gain of the filter is 20 dB. Given, the Butterworth polynomial is, $(s+1)(s^2+s+1)$. Sketch the frequency response indicating the gain in dB, and slope of the gain fall. 4

3B) Draw the circuit of a RC band pass filter. Derive the expression of $A_V(s)$. 3

3C) With the help of suitable diagram show the multiplication of 3 signals. 3

4A) Design the circuits using timer IC's to obtain the waveforms shown in Fig.Q4A. 4

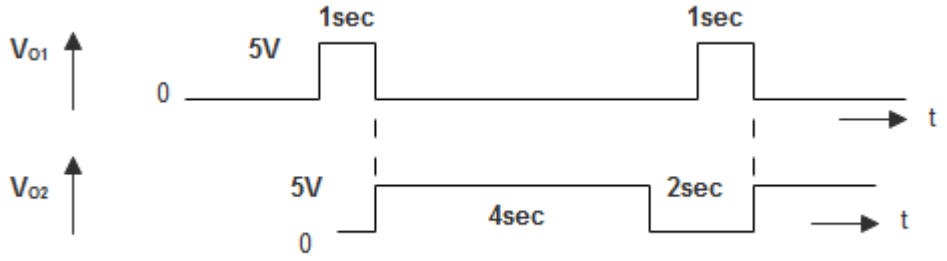

Fig.Q4A

4B) Draw the circuit of a triangular waveform (sweep) generator using timer IC and other components. Explain its operation and obtain the expression of sweep time interval T. 3

4C) With the help of suitable diagram explain the operation of counter ramp type of ADC. Mention its merits and demerits. 3

5A) Design and draw a regulated power supply using a suitable regulator IC and other components to meet the following specifications. Output voltage is varying between 4.5 volts to 12 volts at a maximum load current of 200 mA. Input is 230 volts 50 Hz ac. Assume the ripple factor to design unregulated supply to be 10%. Use a full wave bridge rectifier and calculate the required specifications of the transformer. 4

5B) With a suitable block diagram and waveforms explain the principle of operation of voltage controlled oscillator IC 566. 3

5C) Explain the operation of EX-OR type phase detector and Edge triggered type phase detector of a PLL. 3