Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B. TECH. (E & C) DEGREE END SEMESTER EXAMINATION
JUNE 2019
SUBJECT: I C SYSTEMS (ECE - 2202)

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

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Draw the small signal model for the circuit shown in **Fig. 1A** and determine:
a) Differential Gain $[V_{out}/(V_A-V_B)]$ b) Common mode Gain c) DC voltage at all nodes. Assume $\beta=100$, $V_A=\infty$, $I_S=10^{-16}$A.

1B. Explain the internal architecture of an operational amplifier with help of a block diagram.

1C. Design a current mirror circuit for biasing a BJT for I_C = 5mA. Assume $\pm V_{CC} = \pm 5$V, β = 100, $V_A = \infty$, $I_S = 10^{-16}$A.

(4+3+3)

2A. Define and explain the following Op-amp parameters:
a) Input bias current b) Output offset voltage c) Input offset current d) Slew rate

2B. (i) For the instrumentation amplifier, derive the expression for the output voltage.
(ii) Calculate the output voltage for the circuit shown in **Fig. 2B.**

2C. Design a square wave generator using an Op-amp for the following specifications: Frequency of oscillation= 1kHz, Duty cycle =0.6, β=0.5. Assume C=0.01μF.

(4+3+3)

3A. With the help of a circuit diagram and waveforms, explain the working of a triangular wave generator using Op-amp. Also derive the expression for the frequency of oscillation.

3B. Draw the internal diagram of IC 555 and explain its working.

3C. With the help of a circuit diagram and waveforms explain the operation of a linear ramp generator using IC 555.

(4+3+3)

4A. Design an active low pass filter for the following specifications: Roll of rate=60dB/decade, pass band gain=0dB, Cut-off frequency=10kHz. Assume C=0.01μF.

4B. Obtain an expression for the transfer function for the circuit shown in **Fig. 4B**.
i) What is the magnitude associated with the circuit? ii) What is the phase associated with the circuit? iii) What is the use of this circuit? iv) Plot the magnitude and phase plot as a function of frequency.

4C. For the cascaded filter shown in **Fig. 4C**, plot the frequency response.
i) LPF has a cut-off frequency of 1kHz and HPF has a cut-off frequency of 10kHz
ii) LPF has a cut-off frequency of 10kHz and HPF has a cut-off frequency of 1kHz

(4+3+3)

5A. With the help of a circuit diagram explain the working of 3 bit flash type ADC

5B. Draw the internal diagram of VCO and explain its working.

5C. Draw the circuit diagram of a 4-bit R-2R DAC. Find the (i) Full scale output. (ii) Resolution. Select R = 10kΩ, R_F = 20kΩ, Logic 0 = 0 Volt and Logic 1 = 5Volts

(4+3+3)

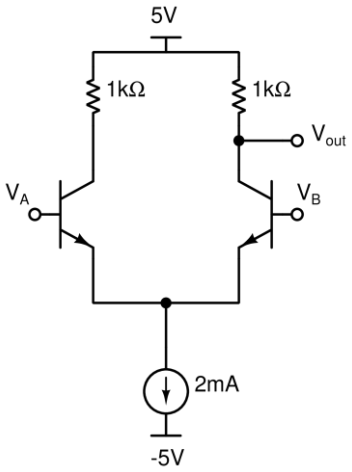

Fig. 1A

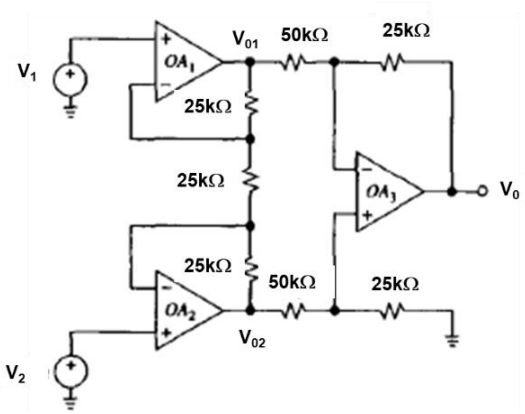

Fig. 2B

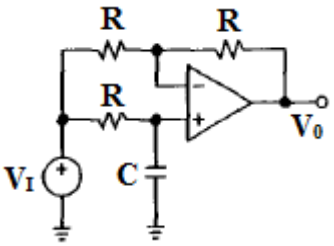

Fig. 4B

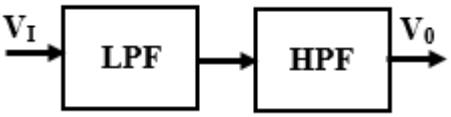

Fig. 4C