Reg. No.											

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

IV SEM B.Tech (BME) DEGREE END-SEMESTER EXAMINATIONS, APRIL 2018.

SUBJECT: INTEGRATED CIRCUIT SYSTEMS (BME 2202)
(REVISED CREDIT SYSTEM)
Thursday, 19th April, 2018, 2 to 5 PM

TIME: 3 HOURS **MAX. MARKS: 100**

Instructions to Candidates:

1. Answer ALL questions.
2. Draw labeled diagram wherever necessary

1A) (i) Draw the circuit of a differential amplifier using transistors. Discuss the DC biasing of this circuit. 3+5

(ii) For the above circuit show that,

$$CMRR = \frac{R_s + h_{ie} + 2(1+h_{fe})R_E}{2(R_s + h_{ie})}$$

1B) For the circuit shown in Fig.Q1b, find V_C, V_O, I_1 and Rin which is the input resistance seen by the voltage source. 6

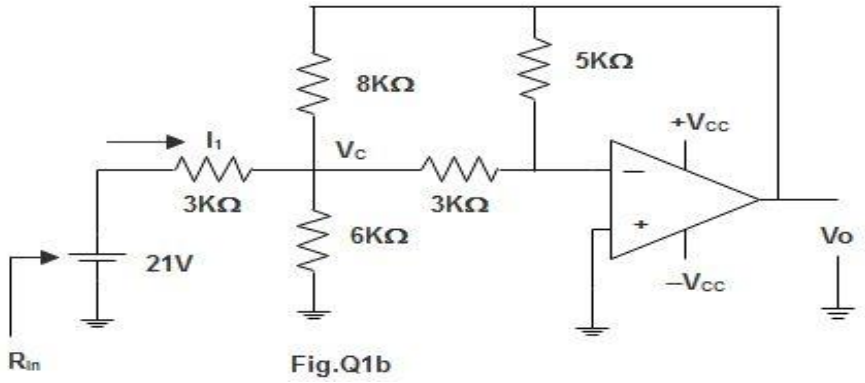

Fig.Q1b

1C) (i) Draw the circuit of a 3 input non-inverting adder using Op-Amp and derive the expression of the output. 4+2

(ii) How this circuit can be modified to operate as an averaging amplifier? Draw the modified circuit.

2A) Draw the circuit of an instrumentation amplifier suitable for amplifying EEG signals. Derive the expression for the overall gain of the amplifier. Calculate the values of the components to achieve an overall gain of 2000. 8

2B) Draw the circuit of a square wave generator using Op-Amp. Draw the corresponding waveforms across the capacitor C and output of the Op-Amp. Derive the expression of the time period T of the square wave. Calculate the values of R and C if the value of feedback factor β=0.5, T=3msec. and the duty cycle is 50%. Select the suitable breakdown diodes to obtain the output swing of square wave of ±5 volts. 6

2C) Draw the circuit of a Logarithmic amplifier with temperature compensation and derive the expression of the output. 6

3A) Design and draw the circuit of a 3rd order band reject Butterworth filter to eliminate the signals of frequencies 2KHz to 15 KHz. The overall gain of the filter is 40dB. Given, the Butterworth polynomial is, $(s+1)(s^2+s+1)$. Sketch the frequency response indicating the gain in dB, and slope of the fall in gain. 8

3B) Draw the prototype delay equalizer circuit. Derive the expression for the voltage gain A_V. In what condition does this circuit behave as an all pass filter? 6

3C) Draw the circuit of a voltage to current converter with floating load and explain its operation. How can this circuit be used in an application for the matching of rectifier diodes? 6

4A) Design the circuits using timer IC's to meet and satisfy the following statements. 8

A red LED and a yellow LED turn ON simultaneously. Red LED remains ON for 1 second and yellow LED remains ON for 3 seconds. A green LED turns ON as soon as RED LED turns OFF and remain ON for 2 seconds. All LED's remain OFF for another 3 seconds and cycle repeats. Assume the V_{CC} value is 5 volts.

4B) Draw the circuit of a voltage to frequency converter using timer IC. Draw the waveforms and derive the expression for the frequency f. 6

4C) Draw the circuit of a 3 bit parallel comparator type ADC. Explain its operation with suitable truth table. 6

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 2.5 volts to 15 volts at a maximum load current of 500 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. 8

5B) With a suitable block diagram explain the principle of operation of phase locked loops. Also discuss on the operation of edge triggered type phase detector. 6

5C) With a suitable circuit diagram and waveforms explain the working of a sample and hold circuit. 6