	Reg. No.								
MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL A Constituent Institution of Manipal University									
IV SEMESTER B.Tech (BME) DEGREE MAKE-UP EXAMINATIONS, JUNE 2017.									
SUBJECT: INTEGRATED CIRCUIT SYSTEMS (BME 2202) (REVISED CREDIT SYSTEM) Wodnesday, 14th June, 2017 - 2 to 5 PM									
TIME: 3 HOURS	lesday, 14 <sup>th</sup>	June, 2	017, 2	to 5	PNI		МАУ	K. MARKS: 1	100

## **Instructions to Candidates:**

Answer ALL questions.
Draw labeled diagram wherever necessary

- 1A) Draw the circuit of a differential amplifier using transistors. Draw the equivalent 8 circuits to find the differential mode gain and common mode gain. Derive the expressions of these gains and obtain the expression of CMRR.
- 1B) Give the block diagram of Op-Amp stages and mention the functions of each block.6 Also list the characteristics of the Op-Amp.
- 1C) Draw the circuit using Op-Amp to obtain the following expression. Give the 6 explanation of each steps to obtain the expression.

 $V_o = 0.5V_1 + 0.4V_2 - 1.5V_3 + V_4$ 

- 2A) Draw the circuit of a positive edge triggered mono-stable multi-vibrator using Op-Amp. With the relevant waveforms explain its operation and derive the expression of the pulse width  $t_{P_1}$
- 2B) Draw the circuit of a voltage to current converter with grounded load using Op-Amp. Explain its operation and obtain the expression of load current and output voltage. 6
- 2C) Draw a full wave precision rectifier circuit. Explain its operation with relevant 6 waveforms.
- 3A) Design and draw a Butterworth active filter to obtain the following frequency 8 response shown in Fig.Q3A. Given the Polynomial,  $s^2 + 1.414s + 1$



- 3B) Design a 2<sup>nd</sup> order band pass filter suitable for QRS detection of acquired ECG, 6 with a mid-band voltage gain  $A_0 = 5$ , a center frequency  $f_0 = 20$  Hz, and a 3 dB band width B=10 Hz. Assume  $C_1 = C_2 = 0.1 \mu F$ .
- 3C) Draw the circuit of a 4 bit ladder type DAC and explain its operation and obtain the 6 expression of the output.
- 4A) Draw the circuit of a sweep generator using timer IC and other components. With the relevant waveforms explain its operation and obtain the expression of the time period T.
- 4B) Design and draw an astable multi-vibrator circuit using timer IC for the following specifications. Duty cycle is 90%. Frequency of the square wave is 10 KHz. Output swing is 0 to10 Volts. Draw the relevant waveforms.
- 4C) With a suitable internal diagram of timer IC555, explain the functions of each pin. 6
- 5A) Design and draw a regulated power supply using IC 7805 to meet the following specifications. Output voltage can be varied between 6 to 8 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 12%. Use a full wave bridge rectifier and calculate the required specifications of the transformer.
- 5B) Draw the internal diagram of VCO IC566. Explain its operation and write the 6 expression of VCO frequency  $f_0$ .
- 5C) With a suitable block diagram, explain the operation of PLL. 6