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MANIPAL INSTITUTE OF TECHNOLOGY (A Constituent Institute of Manipal University) Manipal – 576 104



MAX. MARKS: 100

(6)

IV SEMESTER B.Tech. (BME) DEGREE MAKEUP EXAMINATIONS JUNE/JULY, 2016

SUBJECT: INTEGRATED CIRCUIT SYSTEMS (BME 2202) (REVISED CREDIT SYSTEM) Thursday, 30th June, 2016: 2 pm to 5 pm.

TIME: 3 HOURS

Instructions to Candidates:

- 1. Answer ALL questions.
- 2. Draw labeled diagram wherever necessary
- 1A) For a non-inverting Op-Amp amplifier $R_1=5K\Omega$, $R_F=100K\Omega$. Assume that the amplifier (6) is nulled at 25°C. Calculate the error voltage and output voltage at 40°C, if Vi=100mV dc. Given, input offset voltage drift is $50\mu V/^{\circ}C$ and input offset current drift is $500pA/^{\circ}C$.
- 1B) For the circuit shown in **Fig. Q1B**, obtain the expression of V_0 .



- 1C) Draw the circuit of an instrumentation amplifier suitable for amplifying the voltage (8) signals from a bridge type of temperature transducer. Derive the expression of the output.
- 2A) Explain with suitable circuits, how the input and output resistance of an Op-Amp is (6) measured practically?
- 2B) Draw a sample and hold circuit using Op-Amp and explain its operation with (6) waveforms.
- 2C) Design and draw the circuit of a 4th order low pass active Butterworth filter for the following specifications. The upper cutoff frequency is 100Hz and the overall gain of the filter is 1000. Given the Butterworth polynomial given is,

 $(s^{2} + 0.765s + 1)(s^{2} + 1.848s + 1)$

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3A) Design and draw the circuit of a regulated power supply for the following (6) specifications.

Output voltage can be varied between 2 to 8 volts. Maximum load current will be 500 mA. Use a suitable regulator IC. Assume unregulated input voltage is available.

- 3B) With a suitable circuit how Op-Amp can be used to test rectifier diodes and zener (6) diodes?
- 3C) Draw the circuit of a function generator using Op-Amp to generate square wave and (8) triangular waveform. Explain the operation of the circuit with waveforms.
- 4A) Explain with block diagram how three signals V_{s1} , V_{s2} and V_{s3} are multiplied using log (6) and antilog amplifiers?
- 4B) Explain how timer IC can be used as a Schmitt trigger circuit? (6)
- 4C) Design and draw the suitable circuits to obtain the waveforms V₀₁ and V₀₂ as shown in (8) **Fig. Q4c**. Use Timer IC's



- 5A) Draw the circuit of a 4 bit binary weighted digital to analog converter. Derive the (6) expression of the output.
- 5B) With a suitable diagram explain the operation of successive approximation type ADC (6) and mention its advantages and limitations.
- 5C) With the help of suitable block diagram explain the operation of phase locked loops and (8) mention its applications.