QP Code : **31228**

(3 Hours) [Total Marks : 80

N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** from remaining **five** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable data if necessary and mention the same in the answersheet.

1. Solve the following (any **five**) :— 20
   (a) Compare open loop & closed loop configurations of operational amplifier.
   (b) Draw the diagram of a floating load voltage to current converter and derive the expression for the output current.
   (c) Differentiate between inverting & non-inverting comparators.
   (d) Explain the functional block diagram of timer 555.
   (e) Explain current fold-back protection in voltage regulators.
   (f) Draw the waveforms for the outputs of IC 7490 with respect to the clock when it is used as a bi-quinary decade counter.

2. (a) Draw a neat circuit diagram for an instrumentation amplifier using three op-amps & derive the expression for its gain. Explain how the gain can be varied. 10
   (b) Draw a neat diagram of a Wien bridge oscillator using op-amp. Derive its frequency of oscillation. What are the values of R & C if its frequency of oscillation = 1 kHz? 10

3. (a) With the help of a neat diagram & voltage transfer characteristics explain the working of a non-inverting Schmitt trigger. Derive the expressions for the threshold levels & explain how they can be varied. 10
   (b) Draw the circuit diagram for a square and triangular waveform generator using operation amplifiers. With the help of waveforms at suitable points in the circuit explain its working. Explain how the duty cycle can be varied. 10

4. (a) Design a voltage regulator using IC 723 to give output voltage of 15 V and output current of 1.5 A. 10

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   (b) With the help of a neat diagram explain how IC LM 317 can be used   6
       as a variable voltage regulator.

   (c) Differentiate between linear regulator & switching regulator.   4

5. (a) Draw the diagram for an astable multivibrator using timer 555. Design   10
       the same for a frequency of 5 KHz with duty cycle 70%. Draw the
       waveforms across the charging capacitor and at the output.

   (b) With the help of a neat circuit diagram explain the working of universal   10
       shift register IC 74194 as a 4 bit, 4 state ring counter with single
       circulating 'zero'.

6. Write short notes on any **four** :–   20
    (a) Frequency to voltage converter
    (b) Waveform generator XR 2206
    (c) Voltage controlled ascillator 566
    (d) Synchronous counter 74163
    (e) Arithmetic logic unit 74181

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