(3 Hours)   **[Total Marks: 80]**

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

Q.1   Attempt any 4 questions:
(A)   Draw a neat circuit of Voltage to Current converter with floating load. Give its output expression.   **[05]**
(B)   Draw a neat diagram of non-inverting Schmitt trigger and its voltage transfer characteristics.   **[05]**
(C)   Discuss the various parameters of op-amp.   **[05]**
(D)   Draw the functional block diagram of IC 723.   **[05]**
(E)   Draw a neat circuit of half wave precision rectifier. Draw its input and output waveforms.   **[05]**

Q.2   **(A)**   What is an instrumentation amplifier? Design an instrumentation amplifier using 3 op-amps for gain variation of 0.5 to 100.   **[10]**
(B)   With the help of a functional block diagram explain the working of voltage regulator LM317 to give an output voltage variable from 5 V to 10 V to handle maximum load current of 500 mA.   **[10]**

Q.3   **(A)**   Draw a neat circuit with all the component values of astable multivibrator using IC 555 to obtain 40% duty-cycle.   **[10]**
(B)   Design a second order Butterworth high pass filter for cut off frequency of   1 kHz and pass-band gain of AF=2.   **[10]**

Q.4   **(A)**   Draw the circuit diagram of a square and triangular waveform generator using op-amps and explain its working with the help of waveforms. For variation in duty cycle what is the modification needed in the circuit.   **[10]**
(B)   Design a voltage regulator using IC 723 to give V_o = 10 V to 32 V and output current of 2 A.   **[10]**

Q.5   **(A)**   Draw a neat circuit diagram of RC phase shift oscillator using op-amp. Derive its frequency of oscillation. What are the values of R and C if its frequency of oscillation is 2 kHz?   **[10]**
(B)   Draw a mod-7 counter using IC 7490. Draw its timing diagram.   **[10]**

Q.6   Write short notes on: (Attempt any two)
(A)   Power amplifier LM380.   **[10]**
(B)   IC 74181 Arithmetic Logic Unit.   **[10]**
(C)   Internal structure of IC 7493.   **[10]**

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