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 $V_o = 10 \text{ V}$ to $32 \text{ V}$ 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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