(Time: 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)   With neat circuit explain the working of comparator circuit.   [05]
(b)   Write short note on: Bi FET and Bi MOS differential amplifier circuit.   [05]
(c)   Design a circuit with Op Amp, resistors and a capacitor that simulates an inductor of 1 H.   [05]
(d)   For a regulated dc power supply the output voltage varies from 12 V to 11.6 V when the load current is varied from 0 to 100 mA which is the maximum value of I_L. If the ac line voltage and temperature are constant, calculate the load regulation, % load regulation and output resistance of the power supply.   [05]
(e)   How can the true RMS value of voltage signal to measured using analog multipliers.   [05]

Q.2   (a)   Design an adjustable output voltage regulator circuits using IC 317 to give 5 to 12 volts at I_L=1 Amp. Given; I_{ADJ} =100 µA and let R_1=240 Ω.   [10]
(b)   Explain the operation of single slope integrating ADC and state its advantages, disadvantages.   [10]

Q.3   (a)   Draw a neat circuit diagram of a *RC* phase shift oscillator using op-amp. Derive its frequency of oscillation. What are the values of *R* and *C* for frequency of oscillation to be 1 kHz?   [10]
(b)   Explain the working principle of successive approximation type ADC.   [10]

Q.4   (a)   With the help of a neat diagram, input and output waveforms and voltage transfer characteristics explain the working of non-inverting Schmitt trigger. Derive the expressions for its threshold levels. Explain how these levels can be varied?   [10]
(b)   Design a differentiator to differentiate an input signal that varies in frequency from 10 Hz to about 500 Hz. Draw its frequency response. If a sine wave of 2 V peak at 500 Hz is applied to the differentiator, write expression for its output and draw output waveform.   [10]

Q.5   (a)   Draw the circuit diagram of a square and triangular waveform generator using op-amp. With the help of waveforms at suitable points in the circuit explain its working. Explain how duty cycle can be varied?   [10]

(b) Analyze the circuit given in Fig. 5(b). Draw the waveforms at output terminal v_O [10] and across the capacitor C. Comment on the duty cycle of output waveform. Take diode D as an ideal diode and assume R_A is equal to R_B.
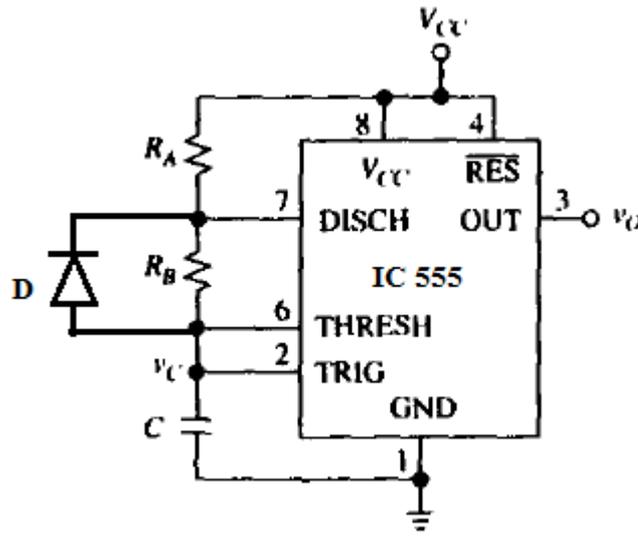

Fig. 5(b)

Q.6 Short notes on: (Attempt any four)
(a) Wilson current source. [05]
(b) Temperature compensated log amplifier. [05]
(c) Wein bridge oscillator. [05]
(d) XR2206 waveform generator. [05]
(e) Switch mode power supply. [05]

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