(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   [05]
          inductor of 1 H.

     (d)   For a regulated dc power supply the output voltage varies from 12 V to 11.6 V   [05]
          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.

     (e)   How can the true RMS value of voltage signal to measured using analog   [05]
          multipliers.

Q.2   (a)   Design an adjustable output voltage regulator circuits using IC 317 to give 5 to   [10]
          12 volts at I_L=1 Amp. Given; I_{ADJ} =100 μA and let R_1=240 Ω.

     (b)   Explain the operation of single slope integrating ADC and state its advantages,   [10]
          disadvantages.

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

     (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   [10]
          characteristics explain the working of non-inverting Schmitt trigger. Derive the
          expressions for its threshold levels.Explain how these levels can be varied?

     (b)   Design a differentiator to differentiate an input signal that varies in frequency   [10]
          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.

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

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(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.
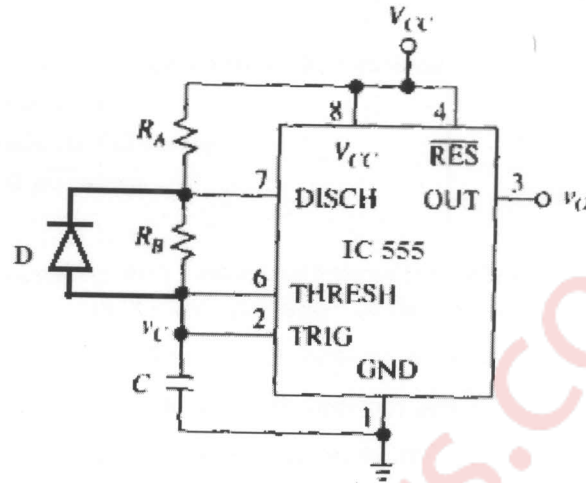

Fig. 5(b)

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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