(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) Give ideal characteristics of op-amp and give their practical values. [05]

(b) Compare linear and switching voltage regulator. [05]

(c) Design a circuit for $V_O = V_1 + V_2$ using single op-amp and few resistors. [05]

(d) What are the advantages of switch capacitor filters? [05]

(e) Explain op-amp as window detector. [05]

Q.2 (a) With the help of a neat diagram and voltage transfer characteristics explain the working of an inverting Schmitt trigger. Derive the expressions for its threshold levels. [10]

(b) Draw a neat circuit diagram of a Wien bridge oscillator using op-amp. Derive its frequency of oscillation. What are the values of R and C for frequency of oscillation to be 965 Hz? [10]

Q.3 (a) Draw the circuit diagram of a square and triangular waveform generator using op-amp and explain its working with the help of waveforms. [10]

(b) The circuit given in Fig. 3(b) is similar to that of internal diagram of IC555 with slight modifications in the internal resistances to value 2R. Analyse this circuit and draw the waveforms at output terminal v_{out} and across the capacitor C. Comment on the duty cycle of output waveform when i) R_A is less than R_B, ii) R_A is equal to R_B, and iii) R_A is greater than R_B. [10]

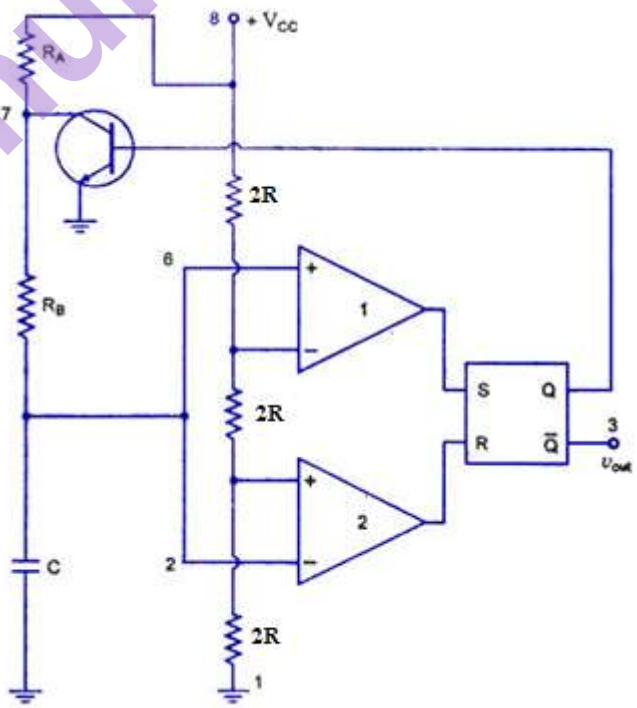

Fig. 3(b)

Q.4 (a) Design a second order Butterworth high pass filter for cut off frequency of 1 kHz and pass-band gain of AF=2. [10]

(b) With a neat circuit derive an expression for the output of an instrumentation amplifier. [10]

Q.5 (a) With neat circuit explain R/2R ladder digital to analog converter. [10]

(b) With the help of a functional block diagram explain the working of voltage regulator LM317 to give an output voltage variable from 6 V to 12 V to handle maximum load current of 500 mA. [10]

Q.6 Short notes on: (Attempt any four)

(a) Effect of swamping resistor. [05]

(b) Current fold-back protection circuit in voltage regulator. [05]

(c) Voltage to Current converter. [05]

(d) Peak detector circuit. [05]

(e) Working of PLL IC 565. [05]

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