

(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]

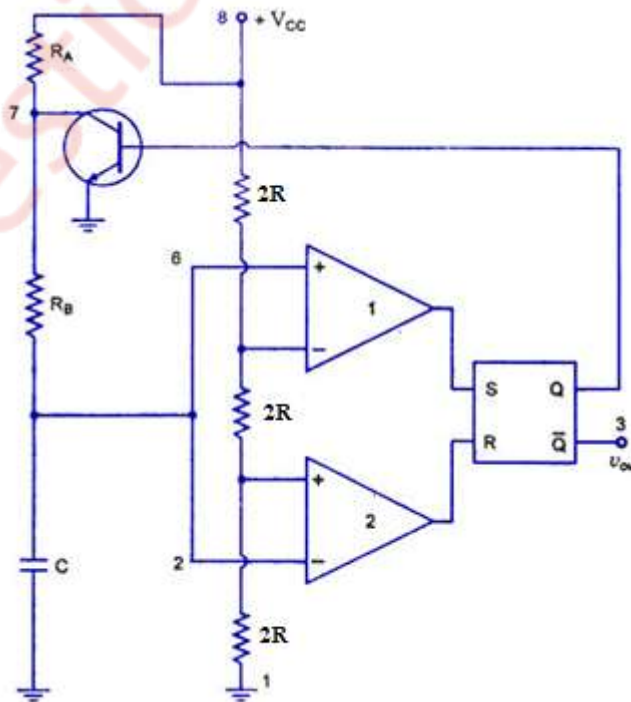


Fig. 3(b)

- 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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