



- 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.

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Q.1 Attempt any 4 questions:

- (a) How precision rectifiers are different than simple diode rectifiers? [05]  
 (b) Compare ideal op-amp with practical op-amp. [05]  
 (c) Find  $v_N$ ,  $v_P$ , and  $v_O$  in the circuit of Fig. 1(c) if  $v_S$  is 9 V. [05]

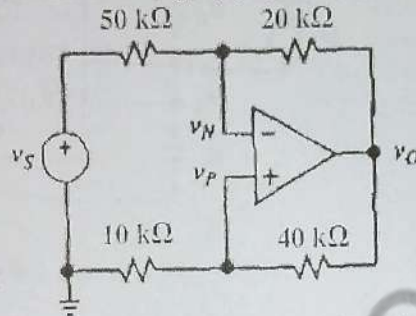


Fig. 1(c)

- (d) Design a circuit for  $V_O = 2V_1 - 3V_2$  using single op-amp and few resistors. [05]  
 (e) Explain how a resistor can be simulated by a switch capacitor circuit. [05]
- Q.2 (a) Design a voltage regulator using IC 723 to give  $V_o = 4$  V to 32 V and output current of 2 A. [10]  
 (b) Explain  $R-2R$  ladder type digital to analog convertor. [10]
- Q.3 (a) Explain analog to digital conversion using successive approximation method. [10]  
 (b) 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]
- Q.4 (a) What is an instrumentation amplifier? Draw a neat circuit of an instrumentation amplifier using 3 op-amps. Derive its output voltage equation. [10]  
 (b) 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]
- Q.5 (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) Analyze the circuit given in Fig. 5(b). Draw the waveforms at output terminal  $v_O$  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  $R_B$ . [10]

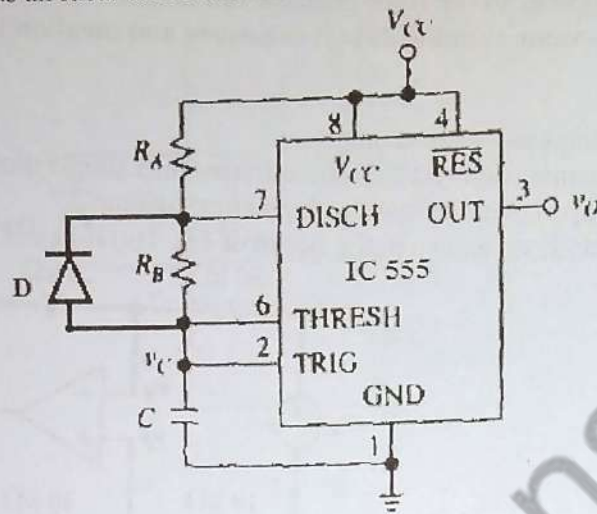


Fig. 5(b)

Q.6

Short notes on: (Attempt any four)

- Sample and hold circuit.
- Three terminal fixed voltage regulator.
- Monolithic switching regulator.
- XR2206 waveform generator.
- Wilson current source.

[05]

[05]

[05]

[05]

[05]

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