

(3 Hours)

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 the questions.

- a) In the circuit given in Fig. 1(a) if the voltage V_+ and V_- are to be amplified by the same factor, the value of R should be _____. [01]
 i) 3.3k ii) 33k iii) 330 Ω iv) None of these. [04]
Justify.
- b) If the input to the ideal comparator shown in Fig. 1(b) is a sinusoidal signal of 8 volt peak to peak without any DC component, then the duty cycle of the output comparator is _____. [01]
 i) 33.33% ii) 25% iii) 20% iv) None of these. [04]
Justify.
- c) What is the frequency of IC 555 astable multivibrator shown in Fig. 1(c)? [01]
 i) 241 Hz ii) 178 Hz iii) 78 Hz iv) 8 Hz. [04]
Justify.
- d) An amplifier using OPAMP with slew rate $SR = 1 \text{ V}/\mu\text{s}$ has a gain of 40 dB. If this amplifier has to amplify sinusoidal signal of 20 kHz faithfully without any slew rate induced distortion, then the input signal must not exceed _____. [01]
 i) 795 mV ii) 395 mV iii) 79.5 mV iv) 39.5 mV. [04]
Justify.

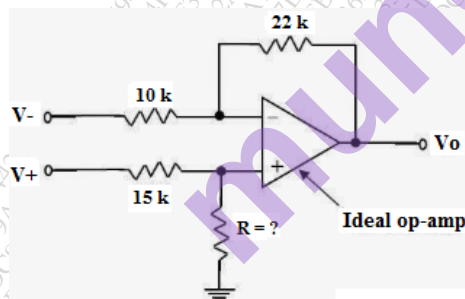


Fig. 1(a)

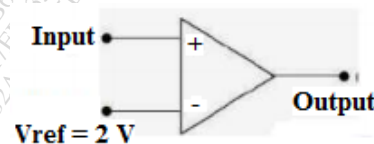


Fig. 1(b)

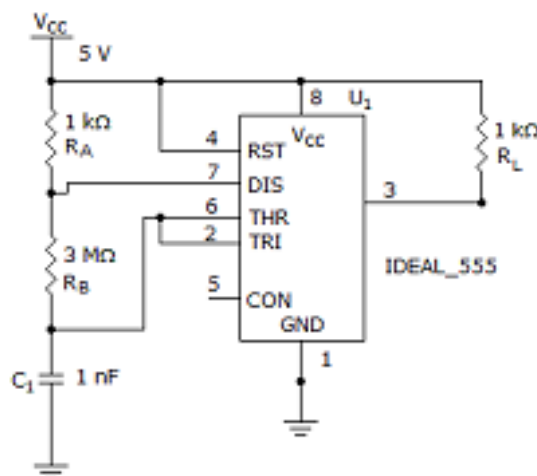


Fig. 1(c)

- Q.2** a) Sketch the implementation of an instrumentation amplifier using three opamps and explain its operation. [10]
- b) Compare ideal and practical opamp. [5]
- c) Explain current foldback protection in voltage regulators. [5]
- Q.3** a) Design a Schmitt trigger circuit to convert 5V, 1kHz sinusoidal signal to square wave using 741 IC, $V_{UT} = 0.8 \text{ V}$, $V_{LT} = -0.8 \text{ V}$ and $\pm V_{sat} = \pm 11 \text{ V}$. Draw its transfer characteristics, input and output waveforms. [10]
- b) With the help of circuit diagram, derive the expression of output analog voltage for a weighted resistor DAC. [10]
- Q.4** a) Design an IC 555 astable multivibrator for an output frequency 1 kHz and a duty cycle of 60%. [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.5** a) Design a Wein Bridge oscillator using opamp to oscillate at a frequency of 965 Hz and explain the working of Wein bridge oscillator. [10]
- b) List and explain the various performance parameters of DAC. [10]
- Q.6 Short notes on: (Attempt any four)** [20]
- a) Comparison of linear and switching regulators.
- b) Active filters using opamp
- c) Precision rectifiers
- d) PLL IC 565
- e) Widlar current source