

17445

15116

3 Hours / 100 Marks

Seat No.

--	--	--	--	--	--	--	--

- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Preferably, write the answers in sequential order.

Marks

- 1. a) Attempt any SIX of the following:** **12**
- (i) Draw equivalent circuit of an op - amp.
 - (ii) Draw circuit diagram of basic integrator using op - amp.
 - (iii) State the need of signal conditioning.
 - (iv) List any four specifications of LM 324.
 - (v) Draw diagram of non - inverting amplifier.
 - (vi) Define following terms related with filter.
 - 1) Cut - off frequency
 - 2) Stop band
 - (vii) Draw ideal and practical response of band reject filter with proper labelling.
 - (viii) Draw pin diagram of IC - 555.

P.T.O.

b) Attempt any TWO of the following:

8

(i) Define:

- 1) Supply voltage rejection ratio.
- 2) Input offset voltage
- 3) Slew rate
- 4) Input bias current

(ii) List the ideal characteristics of op - amp with their ideal values (any four).

(iii) Describe the term dual input balanced output differential amplifier and dual input unbalanced output differential amplifier and draw single input unbalanced output differential amplifier.

2. Attempt any FOUR of the following:

16

a) Compare open loop and close loop configuration on the following basis

- (i) Circuit diagram
- (ii) Bandwidth
- (iii) Gain
- (iv) Applications

b) Draw diagram of voltage follower. Why it is called voltage follower? State its one application.

c) Describe the operation of instrumentation amplifier using three op - amp.

d) Draw the diagram of log amplifier using op - amp and derive expression for its output voltage.

e) Draw the circuit diagram of window detector and describe its operation.

f) Design and draw low pass filter with cut - off frequency 1 KHz and passband gain of 2.

3. Attempt any FOUR of the following:

16

- a) Design and draw the circuit for following operation using op - amp.

$$V_0 = V_1 + V_2 - 2V_3$$

- b) Explain the concept of frequency compensation of op - amp and offset nulling.
- c) Design the circuit to obtain output voltage $V_0 = -5(V_1 + V_2)$. Draw the designed circuit.
- d) Draw circuit diagram and input output waveforms of inverting ZCD and non-inverting ZCD. (zero crossing detector)
- e) Draw circuit diagram of peak detector and explain with input output waveforms.
- f) Draw circuit diagram and frequency response of wideband pass filter.

4. Attempt any FOUR of the following:

16

- a) Suggest the op - amp based circuit to perform below operation.

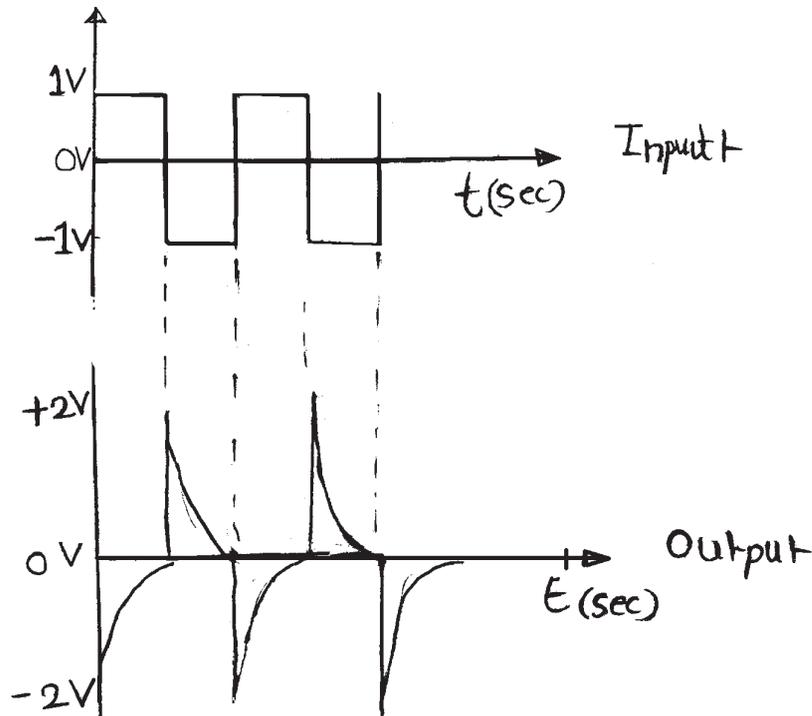


Fig. No. 1

- b) Draw circuit diagram of current to voltage converter and derive the expression for its output.
- c) Describe the operation of op - amp based schmitt trigger for sine to square wave conversion with the help of circuit diagram.
- d) Suggest and draw op - amp based circuit using butterworth filter to fulfill following response.

Gain in dB

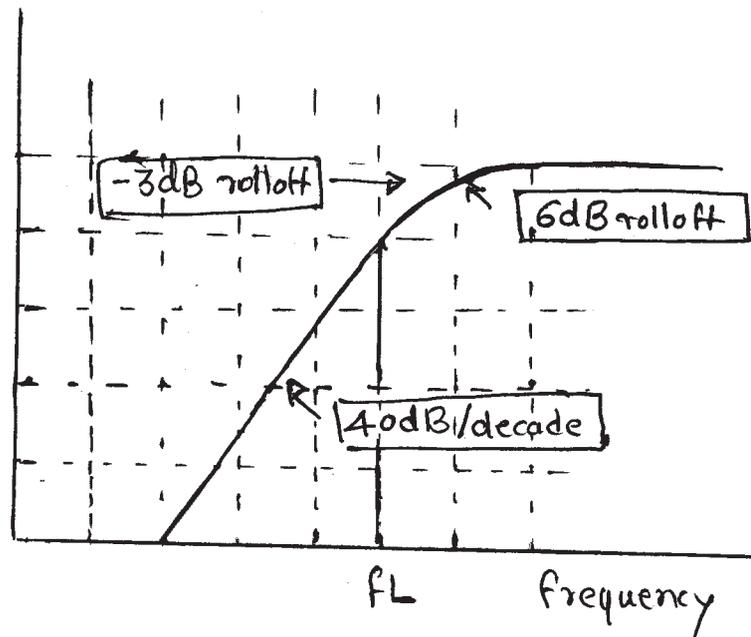


Fig. No. 2

- e) Draw circuit diagram of active notch filter. Describe its operation.
- f) Classify op - amp filters on following basis.
- (i) Component used
 - (ii) Frequency range
 - (iii) Frequency response
 - (iv) Nature of passband and stop band

5. Attempt any FOUR of the following:**16**

- a) Draw and describe the operation of touch plate switch using IC - 555.
- b) Draw block diagram of SE 555. State function of both internal transistor in IC - 555.
- c) Define and state the expression for lock range and capture range of PLL.
- d) Define schmitt trigger. Draw schmitt trigger using IC - 555 Draw its hysteresis diagram.
- e) Design and draw op - amp based phase shift oscillator for frequency 200 Hz.
- f) For IC 555 configured as astable multivibrator. $R_1 = 5.8 \text{ K}\Omega$, $R_2 = 2.8 \text{ K}\Omega$ and $C = 0.1 \mu\text{F}$. Find the frequency of oscillation and duty cycle. Draw output waveforms.

6. Attempt any FOUR of the following:**16**

- a) Design and draw monostable multivibrator using IC 555 with $T_p = 1 \text{ ms}$.
 - b) Describe with the help of block diagram the operation of multiplier using PLL.
 - c) Describe the operation of phase detector and role of vco in PLL.
 - d) Draw and describe wein bridge oscillator using op - amp.
 - e) Draw block diagram of vco using IC - 555. Describe how output frequency varies with variation in voltage applied to pin 5 of IC 555.
 - f) Draw and describe bistable multivibrator using IC - 555.
-