

17445

21415

3 Hours / 100 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. a) **Attempt any SIX of the following:** **12**
- (i) Draw input and output waveform, when the input signal is applied to the inverting input terminal of OP-AMP.
 - (ii) Draw output waveforms for active differentiator for sine and square wave input.
 - (iii) State the need of signal conditioning and signal processing.
 - (iv) Draw pin diagram of IC LM324.
 - (v) Draw the output waveforms of inverting ZCD with sine wave input is $5V_{pp}$
 - (vi) Classify filters based on frequency response characteristics.
 - (vii) Give the relation between roll off rate and order of filter.
 - (viii) Define multivibrator and give its classification.

P.T.O.

b) Attempt any TWO of the following:

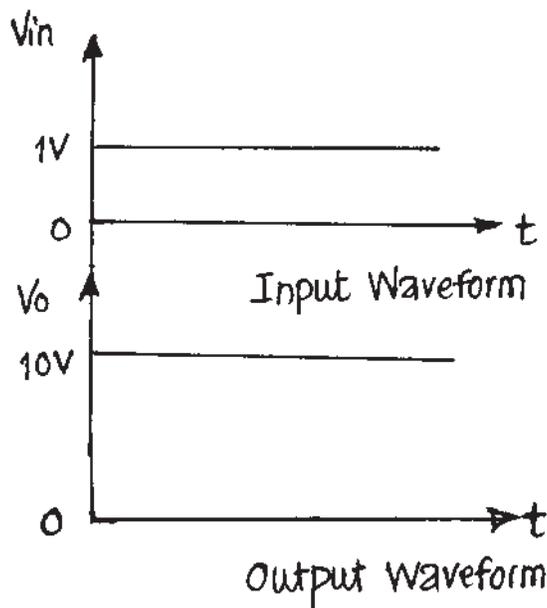
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- (i) Define the following parameters of OP-AMP and give their ideal values.
 - 1) CMRR
 - 2) Input offset voltage
 - 3) Slew rate
 - 4) Supply voltage rejection ratio
- (ii) Draw the block diagram of OP-AMP. State the function of each block.
- (iii) Draw ideal and practical voltage transfer characteristic of OP-AMP.

2. Attempt any FOUR of the following:

16

- a) Compare open loop and closed loop configuration of OP-AMP with respect to input resistance, output resistance, bandwidth and application.
- b) Draw the circuit of OP-AMP without feedback in inverting mode. Derive the output voltage.
- c) Design a circuit of OP-AMP for the following input and output waveforms. Refer Figure No. 1

Fig. No. 1

- d) Draw the circuit diagram and output waveform for sine and square wave input for output voltage:

$$V_0 = -\frac{1}{RC} \int_0^t V_{in} dt + C$$

- e) Using OP-AMP, draw the circuit to show the output $V_0 = 3(V_1 - 2V_2)$ where V_1 and V_2 are input voltages.
- f) If $R_1 = 2\text{K}\Omega$, $R_F = 100\text{K}\Omega$, $V_{cc} = \pm 15\text{V}$ and rms input voltage, $V_i = 20\text{mV}$. Calculate output voltage in inverting and non-inverting mode.

3. Attempt any FOUR of the following:

16

- a) Draw the circuit diagram of instrumentation amplifier using 3 OP-AMPs. Give the expression at the output of each OP-AMP.
- b) Draw and explain the circuit of V to I converter with floating load using OP-AMP.
- c) Draw the circuit diagram of sample and Hold circuit using OP-AMP.
- d) Draw circuit diagram of temperature compensated log amplifier using OP-AMP.
- e) Explain working of active negative peak detector with neat circuit and waveforms.

- f) Identify the following waveforms. Label the circuit name and draw the circuit diagram for the same. (Refer Figure No. 2)

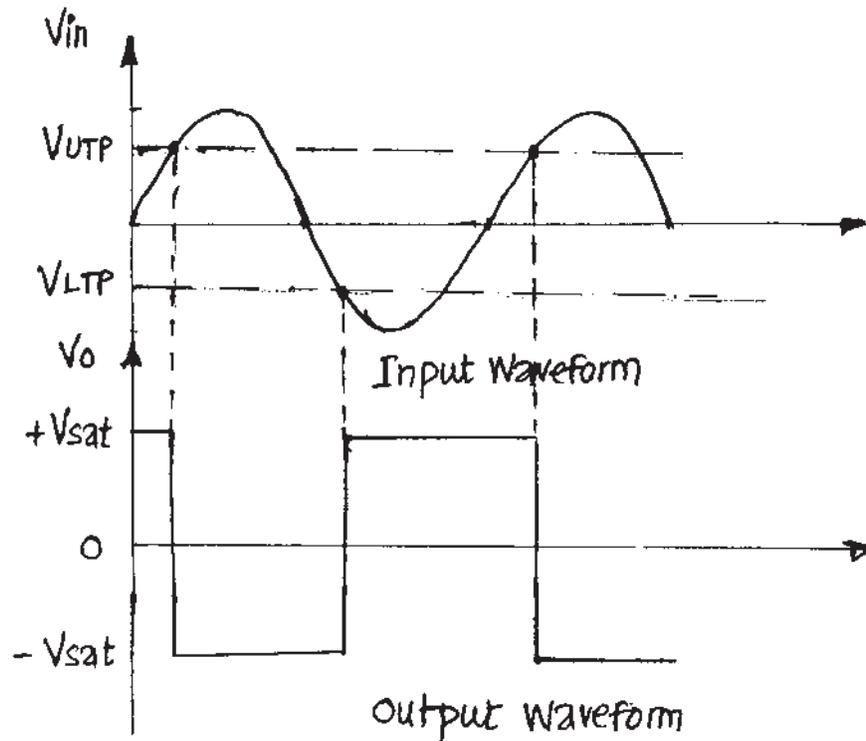


Fig. No. 2

4. Attempt any FOUR of the following:

16

- Draw the circuit diagram and waveforms for non-inverting comparator using OP-AMP.
- Draw the circuit diagram of second order high pass Butterworth filter with frequency response. Give expression for cut-off frequency and gain.
- Design a first order Butterworth low pass filter for passband gain 2 and cut-off frequency 10 KHz.

- d) State two merits and two demerits of active filters over passive filters.
- e) Draw a neat circuit diagram of all pass filter and explain its working.
- f) Suggest and draw OP-AMP based filter circuit to fullfill following response. (Refer Figure No. 3)

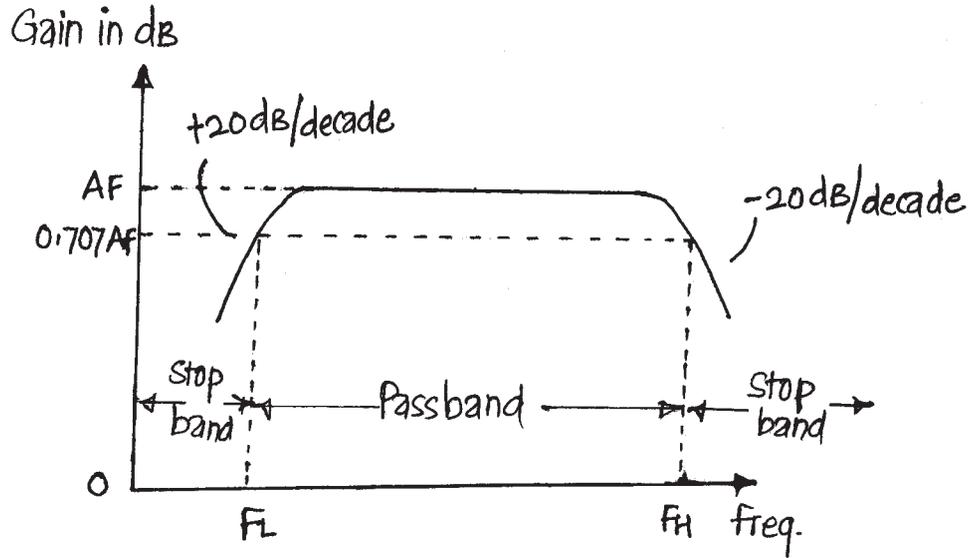


Fig. No. 3

5. Attempt any FOUR of the following:

16

- a) Draw the circuit diagram of touch plate switch using IC 555 and describe its operation.
- b) Calculate the value of UTP and LTP for Schmitt trigger using IC 555 if $V_{cc} = 15V$.
- c) Design monostable multivibrator using IC 555 for pulse width $t_p = 10$ ms. Draw the designed circuit.
- d) Draw and explain block diagram of PLL.
- e) Draw and explain the working of FM demodulator using PLL.
- f) Draw and explain the circuit diagram of multiplier using PLL.

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

- a) Draw the circuit diagram of astable multivibrator using IC 741 and describe its working.
 - b) Draw the circuit diagram of Wein bridge oscillator using IC 741 and give expression for frequency of oscillation.
 - c) Draw the circuit diagram and waveforms of bistable multivibrator using IC 555.
 - d) Draw and explain the circuit diagram of phase shift oscillator using IC 741.
 - e) Draw the circuit diagram of monostable multivibrator using OP-AMP and describe its working.
 - f) Draw a neat circuit diagram of VCO using IC 555 and explain its working.
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