22433

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) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any FIVE of the following:** 10

   a) Draw dual input unbalanced output configuration of differential amplifier.

   b) Draw ideal and practical transfer characteristics of op-amp.

   c) Draw circuit diagram of op-amp based filter which provides the following response. Name the circuit. Refer Figure No 1.
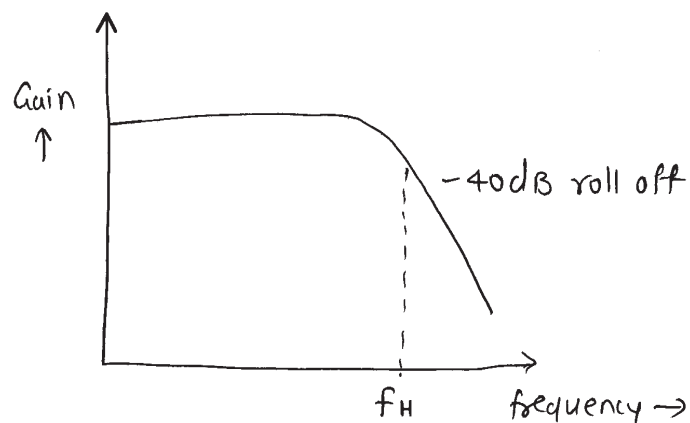

Fig. No. 1

Marks
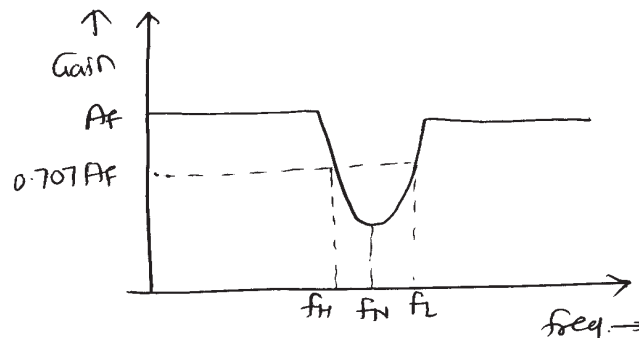
    d) Draw Astable multivibrator circuit using IC555.

    e) Define cut off frequency and Q factor with respect to filter circuit.

    f) Draw circuit diagram of practical op-amp differentiator.

    g) Draw circuit diagram of V to I converter.

2.   **Attempt any THREE of the following:**   **12**

    a) Draw neat diagram of antilog amplifire and explain its working.

    b) Derive an expression for output voltage of inverting amplifier. Also draw circuit diagram.

    c) Design first order Low pass filter with $1\,KHz$ cut off frequency and pass band gain 3.

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

3.   **Attempt any THREE of the following:**   **12**

    a) Explain virtual ground and virtual short.

    b) Using op-Amp draw the circuit to show the out-put $V_o = 3(V_1 - 2V_2)$ where V_1 and V_2 are input voltages.

    c) Design and draw op-amp based phase shift oscillator for frequency 200Hz.

    d) Suggest and draw op-amp based circuit using butter worth filter to fulfill following response. Refer Figure No 2.
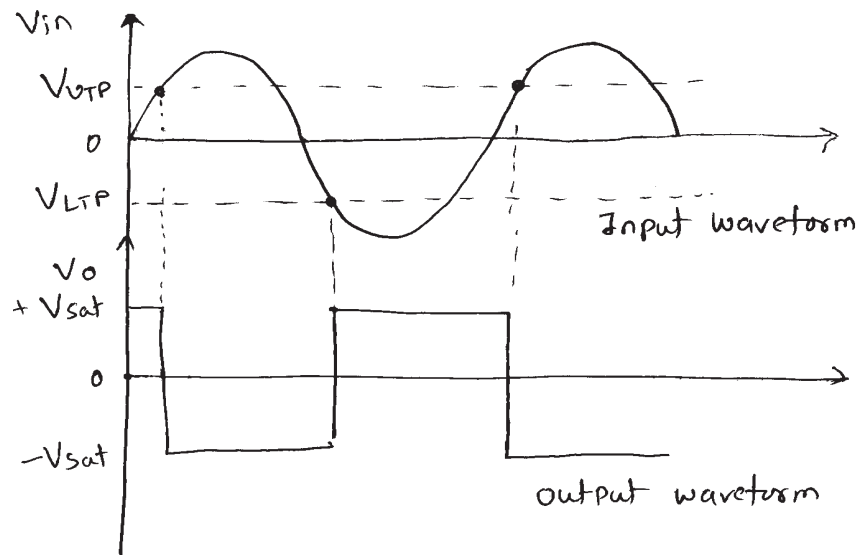

Fig. No. 2

4. **Attempt any THREE of the following:** 12

   a) Draw and explain precision rectifier using op-amp.

   b) If $R_1 = 2\,k\Omega$, $R_f = 100\,k\Omega$, $V_{cc} = \pm 15V$ and RMS input voltage, $V_i = 20mV$. Calculate output voltage in inverting and non-inverting mode.

   c) Identify the following waveforms. Lable the circuit name and draw the circuit diagram for the same. Refer Figure No 4.

Fig. No. 3

   d) Draw band pass and band stop filter using op-amp.

   e) Draw and describe the circuit diagram of Wien Bridge Oscillator using IC 741.

5. **Attempt any TWO of the following:** 12

a) Draw single input unbalanced output differential amplifier and describe its operation. Draw ideal differential amplifier.

b) Draw circuit diagram of bistable multi vibrator using IC555. Explain its working with neat waveforms.

c) For a schmitt trigger with op-amp find threshold voltage V_{UTP} and V_{LTP} when $R_2 = 150\,k\Omega$, $R_1 = 100\,k$ $V_{in} = 500\,mv$. Sine wave saturation voltage $= \pm 15\,V$. Draw diagram and waveform.

6. **Attempt any TWO of the following:** 12

a) Draw the circuit diagram and output waveform for sine and square wave input for output voltage

$$V_o = \frac{-1}{Rc} \int_0^t V_{in}\, dt + c$$

b) Draw and derive the expression for gain of open loop and closed loop configuration of op-amp in inverting mode.

c) Explain the operation of Notch filter with neat circuit diagram and waveform.

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