22423

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) 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) State ideal value of given parameters for Op-Amp IC 741:

(i)   Slew rate

(ii) SVRR

(iii) Input bias current

(iv) Gain bandwidth product.

b) Draw circuit diagram of Op- Amp based basic differentiator.

c) State the merits of active filter over passive filter.

d) Define following terms related with filter:

(i)   Roll off rate

(ii) Pass band

e) State the function of IC 555.

f) Give classification of filter based on components used.
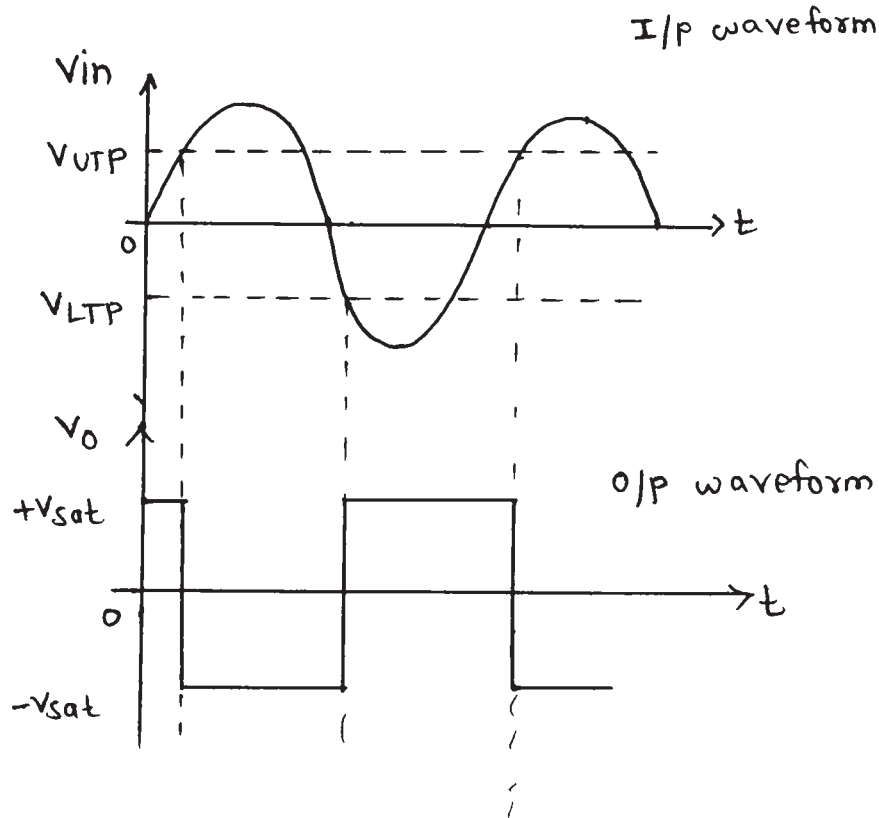
g) Define order of filter with suitable example.

Marks

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

a) Draw pin diagram of IC 741 and state the function of each pin.

b) Draw and explain the working of wein bridge oscillator using IC 741.

c) Describe the operation of FM Demodulator using PLL with block diagram.

d) Calculate the output voltage for open loop non inverting amplifier if V_{in} = 10 mv/dc. Also draw input output waveform.

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

a) Explain virtual ground concept of an op-amp.

b) Draw the circuit diagram of logarithmic amplifier using diodes and obtain the expression for its output voltage.

c) Sketch a second order low – pass butter worth filter with higher cut-off frequency of 1.6 kHz and voltage gain of 1.586.

d) Explain the working of voltage controlled oscillator using IC555. Also draw related waveform.

Marks

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

    a) Identify the following waveforms. Label the circuit name and draw the circuit diagram for the same (Refer Fig. No. 1).

Fig. No. 1

    b) What is the use of level shifter stage? Draw its circuit diagram.

    c) For the following equation sketch the circuit diagram and output waveform for square wave input

$$V_o = R_f \, C_1 \, \frac{dV_{in}}{dt}$$

    d) Draw voltage to current converter with grounded load and derive the expression.

    e) Describe the working of bistable multivibrator with circuit diagram and waveform using IC555.

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

a) If $R_1 = 47\,\Omega$, $R_2 = 27\,k\Omega$, $V_{out} = 0.5\ V_{pp}$ square wave for op-amp based inverting schmitt trigger circuit with supply voltage $\pm 15V$. Determine threshold voltages V_{UTP}, V_{LTP} and hysteresis voltage V_H. For 741 maximum output voltage swing is $\pm 14V$.

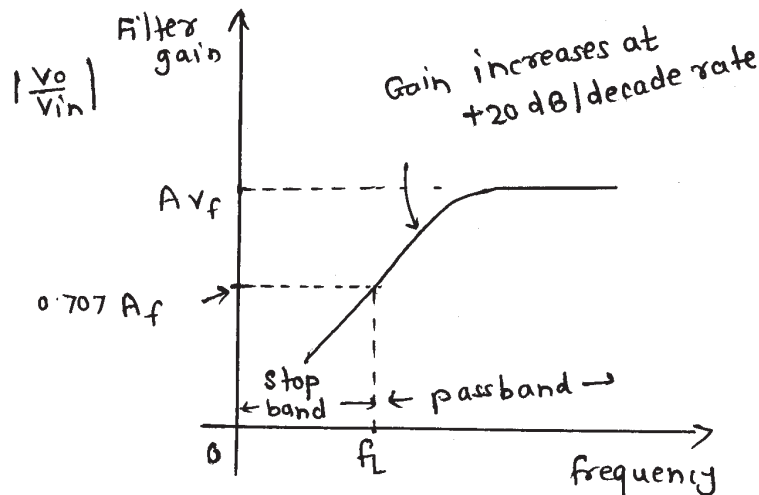b) Identify and draw the op-amp based filter circuit to fulfill the following frequency response (Refer Fig. No. 2).

Fig. No. 2

c) Explain working of op-amp as an instrumentation amplifier with neat diagram.

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

a) Draw the designed circuit for getting output voltage

$$V_o = +\frac{(V_a + V_b + V_c)}{3}$$ and suggest modifications for converting into scaling amplifier.

b) Explain working of window detector with neat diagram. Draw input and output waveforms.

c) Design a first order low pass butterworth filter with cut-off frequency of 2 kHz and pass band gain of two. Draw the designed circuit.

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