22423

22223

3 Hours / 70 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) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1.   **Attempt any <u>FIVE</u> of the following:**   **10**

a)   Define :

i)   Slew rate

ii)   CMRR

b)   Draw circuit diagram of non-inverting adder with 3 inputs.

c)   List any four specifications of IC LM-324.

d)   Give classification of filters.

e)   Draw pin diagram of IC LM-324.

f)   State any two applications of PLL.

g)   Define the following terms with respect to filter :

i)   Q factor

ii)   Roll off rate

Marks

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

a) Describe the function of intermediate stage and level shifter stage of op-amp with its block diagram.

b) Draw and describe following op-amp based operation using log and antilog amplifier $V_0 = V_1 \times V_2$.

c) Draw and explain the working of FM demodulator using PLL.

d) If $V_{in1} = 5m$ Vrms and $V_{in2} = 10$ mVrms, obtain the output voltage for open loop differential amplifier. Assume op-amp is 741 and voltage swing $= \pm 14V$. Also sketch output waveform.

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

a) Draw the closed loop inverting amplifier using op-amp and derive the expression for its gain.

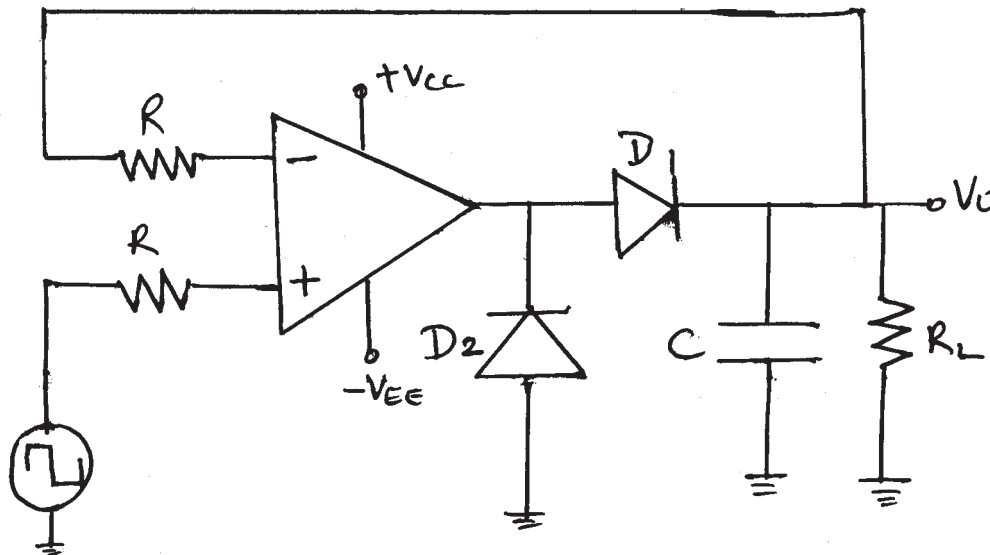b) Identify the given circuit and explain with input-output waveforms. Refer Fig. No. 1.

Figure No. 1.

c) Design and draw 1st order high pass filter with cut off frequency 2 kHz and passband gain of 2.

d) Draw circuit diagram of Bistable multivibrator using IC 555 and describe its working, working with waveforms.

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

a) Suggest op-amp based circuit to convert square wave to spikes and draw the circuit with input and output waveforms.

b) Explain with circuit diagram, the procedure to null the offset voltage in op-amp.

c) Design and draw the circuit for the following operation using op-amp. $V_0 = -(V_1 + V_2 + V_3)$

d) Derive the expression for output voltage of instrumentation amplifier using 3 op-amps.

e) Determine pulse width of Monostable multivibrator using IC 555 timer for $C = 0.047\ \mu F$ and $R = 56\,k\Omega$.

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

a) Derive output equation for voltage to current converter with grounded load. Draw the circuit diagram.

b) Draw second order high pass filter and describe its operation with frequency response characteristics. State the equations for cut off frequency and passband gain.

c) For a schmitt trigger using op-amp, find threshold voltage V_{UTP} and V_{LTP} when $R_2 = 150\,k\Omega$, $R_1 = 100\,k\Omega$. $V_{in} = 500$ mV, sine wave saturation voltage $= \pm 15\,V$. Also find hysteresis voltage.

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

a) Draw and describe working of Colpitt's oscillator with neat circuit diagram. Also compare Colpitt's oscillator with Hartley oscillator with respect to

    i) Frequency of oscillation formula

    ii) Components used

b) Explain the operation of sample and hold circuit with neat diagram. Draw the input-output wave forms.

c) Identify and sketch op-amp based filter circuit to fulfill the following frequency response. Draw its ideal characteristics. Refer Fig. No. 2.
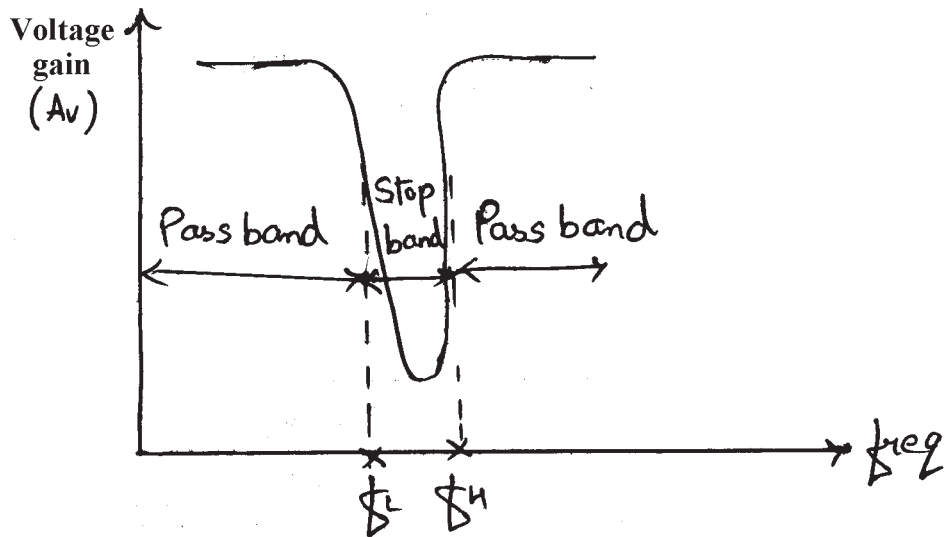

Figure No. 2.