17445

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.

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

(7) Preferably write the answers in sequential order.

Marks

1. a) **Attempt any <u>SIX</u> of the following:** 12

   i) Draw ideal and practical transfer characteristics of op-Amp.

   ii) Draw block diagram of op-Amp. State function of each block.

   iii) Draw pin diagram of IC LM324.

   iv) State functions of following pins of IC555

      1) Control

      2) Trigger

   v) State the function of filter. Draw response of high pass filter.

vi) Draw inverting zero crossing detector and its waveforms with circuit diagram.

vii) Compare open loop and closed loop configuration on basis of

    1) Gain

    2) Bandwidth.

viiii) Define sample and hold period with reference to S/H circuit.

b) **Attempt any TWO of the following:**   08

  i) Draw circuit diagram to generate the following output using op-Amp: $V_0 = 3V_1 + 2V_2 - 4V_3$.
V_1, V_2, V_3 are input voltages.

  ii) Draw single i/p balanced o/p differential amplifier and define the term balanced o/p and unbalanced o/p.

  iii) Draw block diagram of frequency multiplier and describe its working using PLL.

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

a) Draw instrumentation amplifier using 3 op-Amps. State its voltage gain equation.

b) Draw closed loop Inverting amplifier and derive expression for voltage gain.

c) State ideal and typical value of the following parameters of IC741.

  i) Supply voltage rejection ratio SURR

  ii) Common mode rejection ratio (CMRR)

  iii) Slew rate

  iv) Unity gain bandwidth.

Marks

   d) Draw basic integrator and derive the expression for its output voltage.

   e) Draw circuit diagram of V-I converter of floating load. Derive expression for its output.

   f) Draw circuit diagram of astable M/V using IC555. State its frequency equation, duty cycle, time period.

3.   **Answer any <u>FOUR</u> of the following:**   **16**

   a) Draw phase shift oscillator using IC741. Explain the function of each component in it. State the equation for o/p frequency.

   b) Describe the concept of virtual ground with reference to op-Amp.

   c) Draw window detector using op-Amp and give transfer characteristics.

   d) Compare comparator and schmitt trigger on basis of
      i)   Definition
      ii)   Feedback
      iii) Hysteresis
      iv) External reference voltage.

   e) What do you mean by active filter. State its advantages over passband filters (any two). Define passband and stop band w. r. to filters.

   f) Draw and explain operation of phase detector.

Marks

4. Attempt any FOUR of the following: 16

a) Design second order butterworth high pass filter of cut off frequency 10KHz.

b) Draw block diagram of PLL as a FM demodulator. Explain function of each block.

c) Draw circuit diagram of a logarithmic amplifier. State its equation for output voltage.

d) Compare active integrator and active differentiator on basis of
   i)   Output voltage
   ii) Feedback element
   iii) Application in filter.
   iv) Gain

e) Draw and explain touch plate switch using IC555.

f) Draw I-V converter using op-Amp. Derive expression for its output voltage.

5. Attempt any FOUR of the following: 16

a) Draw circuit diagram of op-Amp based filter circuit which provides the following response. Describe its operation. (Refer Figure No. 1)

Fig. No. 1

Marks
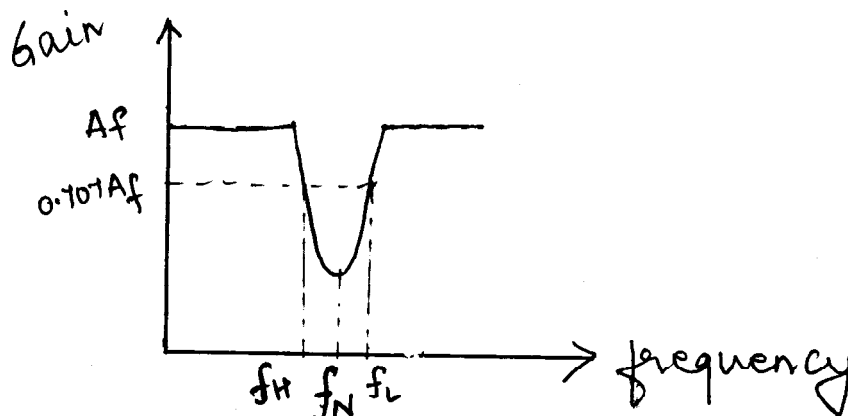
b) Determine pulse width of monostable M/V using IC555 timer for c = 0.047μF and R = 56K.

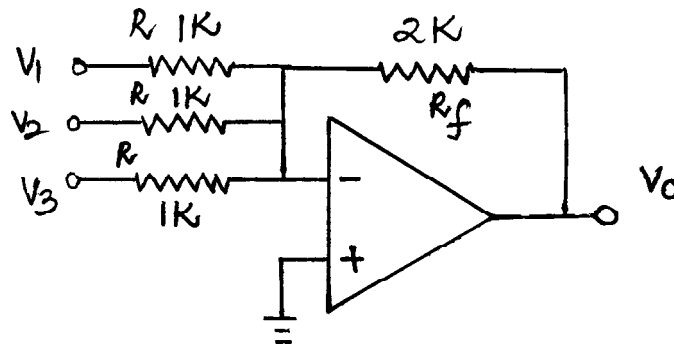c) For the given circuit, obtain the output voltage. (Refer Figure No. 2)

Fig. No. 2

d) Draw and explain operation of wide band filter with help of circuit diagram.

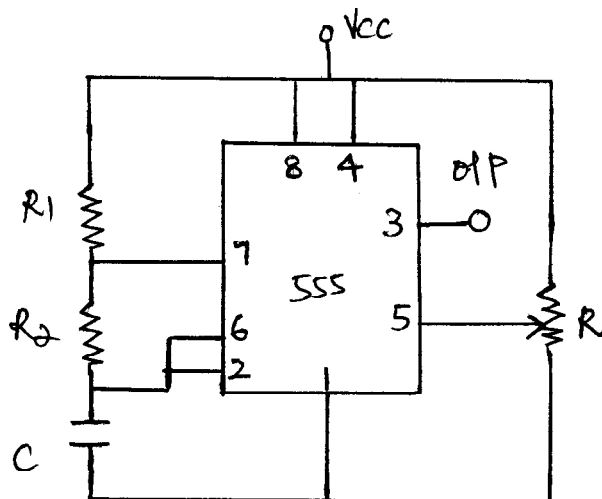e) Identify the circuit, redraw it. Draw the o/p of the circuit. State how will you obtain it. (Refer Figure No. 3)

Fig. No. 3

f) State the need of peak to peak detector. Draw circuit diagram.

P.T.O.

Marks

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

a) Design a circuit to obtain the output voltage $V_0 = 10(V_1 - V_2)$.

b) What is PLL. Explain its operation with a block diagram.

c) Define Multivibrator. State the types of multivibrator. Which M/V can be used as a flipflop. Draw the circuit diagram.

d) Draw circuit diagram of first order low pass filter. Give expression of cut off frequency and gain.

e) For a schmitt trigger with op-Amp find Threshold Voltage V_{UTP} and V_{LTP} when $R_2 = 150K\Omega$, $R_1 = 100K\Omega$, $V_{in} = 500mV$, Sine wave saturation voltage $= \pm15V$.
   Also find hysteresis voltage.

f) Define:

   i)   Input offset voltage.

   ii) Input offset current.

   iii) Input bias current.

   iv) Output offset voltage.