[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1807 **C** **Roll No.....**

Unique Paper Code : 251403

Name of the Course : B.Sc. (Hons.) Electronics

Name of the Paper : Analog Electronics - II : ELHT-402

Semester : IV

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. **1** is compulsory.
4. Use of scientific calculator is allowed.

1. (a) Why is resistor R_E replaced by a constant current bias circuit in differential amplifiers ? (3)

   (b) The output voltage of an op-amp circuit changes by 20V in 4 μs. Determine the slew rate. What is its ideal value for 741 op-amp ? (3)

   (c) What is a zero crossing detector ? What are its limitations ? How can they be overcome ? (3)

   (d) A monostable multivibrator is to be used as a divide-by-2 network. The frequency of the input trigger is 2 KHz. If the value of C = 0.01 μF, what should be the value of R_A ? (3)

   (e) What is a notch filter ? Draw the frequency response of a 60 Hz notch filter. (3)

P.T.O.

2. (a) For a voltage series feedback amplifier, derive the expression for the following parameters : closed loop voltage gain, input resistance, output resistance, bandwidth and total output offset voltage with feedback. (8)

(b) Design a differentiator to differentiate an input signal having frequency 1 KHz. (4)

(c) What is the function of level translator in cascaded differential amplifier ? (3)

3. (a) How can we obtain a subtractor and a summing amplifier using a basic differential op-amp configuration ? Explain with the help of circuit diagrams. Also derive the expression for the output voltage in each case. (6)

(b) Derive an expression for magnitude of gain and phase for open loop configuration of op-amp using high frequency equivalent model. Also plot its frequency response. (4)

(c) Derive an expression for the output voltage of an integrator. What are the limitations of a basic integrator circuit ? How are they overcome using a practical integrator circuit ? (5)

4. (a) Explain the working of a square wave generator with the help of circuit diagram. Derive an expression for frequency of output signal, f_0. Also design a square wave generator having f_0 = 2 KHz using 741 op-amp. (6)

(b) Derive an expression for frequency of oscillation for a wein bridge oscillator. Also show that for sustained oscillations, $R_F/R_1 = 2$. (5)

(c) What are 3 types of digital phase detectors used in phase locked loops ? Calculate conversion gain for each of them if supply voltage is 5V. Which digital phase detector is most widely used and why ? (4)

5. (a) Explain the working of 555 timer as Astable multivibrator with the help of block diagram. (7)

(b) Design an astable multivibrator using 555 timer to generate a square wave of 5 KHz with 70% duty cycle. (5)

(c) Discuss the applications of monostable multivibrator. (3)

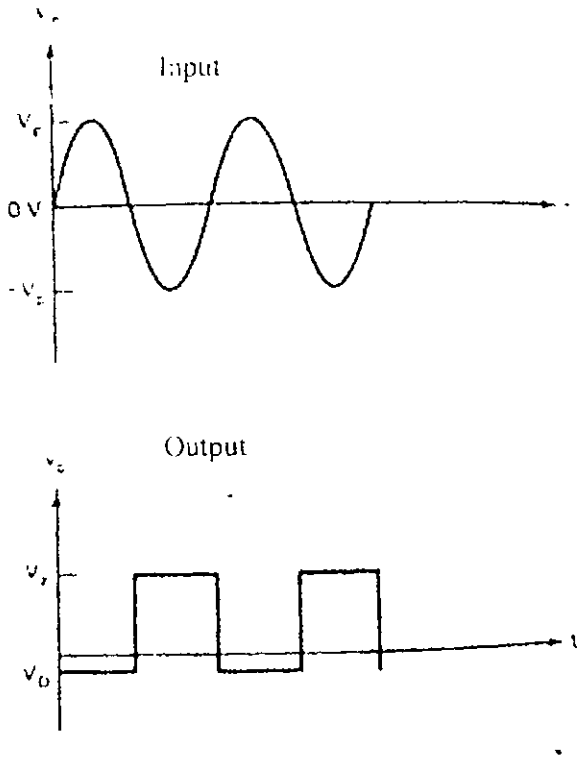
6. (a) Design a second order high pass butterworth filter with low cut off frequency. f_L = 2 KHz. Draw its frequency response. Using frequency scaling technique convert f_L from 2 KHz to 3 KHz. (7)

(b) Draw the circuit diagram of an antilog op-amp and explain is operation. (5)

(c) For a band pass filter with f_L = 200 Hz, f_H = 1 KHz and pass band gain=4. Calculate value of Q and also specify the type of band pass filter. (3)

7. (a) Explain the working of Schmitt trigger. Plot its hysteresis curve. Design a Schmitt trigger having V_{UT} = 20 mV and V_{LT} = –20 mV using 741 op-amp. (8)

(b) The input and output waveforms of a basic op-amp comparator with positive and negative output voltage limiting is as shown :



where V_D is the voltage drop across forward biased zener diode, V_Z is the reverse breakdown voltage of zener diode or zener voltage. Draw the circuit required to get the above output. (5)

(c) State any two applications of sample and hold circuit. (2)