Total number of printed pages = 4

19/4th Sem/DIE 401

2022

ELECTRONICS DEVICES AND CIRCUITS – II

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) Explain voltage and current amplifiers with the help of Thevenin's and Norton equivalent circuits. 2×3=6

   (b) What is a feedback system ? Explain the concept of a feedback system with a suitable diagram. 1+8=9

   (c) Give the comparison between positive and negative feedback. 3

   (d) Define 'Sensitivity and Desensitivity'. 2

2. (a) Derive the expression for voltage gain with positive feedback. 5

[Turn over

(b) Explain the advantages of a negative feedback amplifier. 3

(c) Name the different feedback topologies. 4

(d) The overall gain of a multistage amplifier is 100. When negative feedback is applied, the gain reduces to 10. Find the fraction of the output that is feedback to the input. 3

(e) In a negative feedback amplifier, $A = 100$, $\beta = 0.04$ and $V_s = 50$ mV. Find

(i) Gain with amplifier

(ii) Output voltage

(iii) Feedback factor

(iv) feedback voltage. 4

(f) Negative feedback reduces _____. (Fill in the blank) 1

3. (a) State Barkhausen criteria. Explain the effect of the magnitude of the product of the open-loop gain of the amplifier and the feedback factor on the nature of oscillations. 4

(b) Explain the operation of the LC tank circuit. 4

(c) Draw the circuit diagram of Hartley oscillator and explain its action. 6

(d) A Hartley oscillator is designed with $L_1 = 2$ mH, $L_2 = 20$ μH and a variable capacitance. Determine the range of capacitance values, if the frequency of oscillation is varied between 950 kHz and 2050 kHz. 6

4. (a) Explain the principles of working of the Wein bridge oscillator circuit. Also, find an expression for the frequency of oscillations. 6+6=12

(b) What is the Piezoelectric effect ? Draw the equivalent electric circuit of a quartz crystal. 3

(c) Explain the basic principles of operation of the RC oscillator. 5

5. (a) With the op-amp symbol explain the importance of inverting and non-inverting terminals. Also mention some applications of op-amp. 4+3=7

(b) Define common-mode signal and CMRR. 2

(c) Determine the output voltage of an op-amp for the input voltages of 300 μV and 240 μV. The differential gain of the amplifier is 5000 and the value of the CMRR is 10^5. 4

(d) Why op-amp can be used in open-loop configuration for linear applications ? 3

(e) Explain the various ideal op-amp characteristics. 4

6. (a) Draw non-inverting amplifier using op-amp and derive an expression for its output voltage. 7

(b) Draw the subtractor circuit using op-amp and derive the expression for the output voltage. 7

(c) A 5 mV, 1 kHz sinusoidal signal is applied to the input of an op-amp integrator for which R1 = 100 kΩ and C = 1 μF. Find the output voltage. 6

7. Write short notes on any *four* of the following : 5×4=20

(i) Differential amplifier

(ii) Voltage follower

(iii) Tuned amplifier

(iv) Crystal oscillator

(v) Multi-vibrator.