

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.

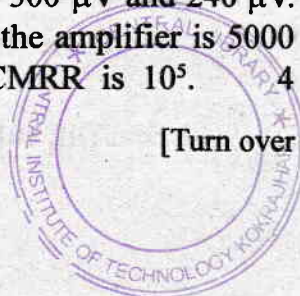
Answer any *five* questions.

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

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- (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 $L_1 = 2 \text{ mH}$, $L_2 = 20 \text{ } \mu\text{H}$ 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 $R_1 = 100 \text{ k}\Omega$ and $C = 1 \text{ }\mu\text{F}$. Find the output voltage. 6
7. Write short notes on any *four* of the following : $5 \times 4 = 20$
- (i) Differential amplifier
 - (ii) Voltage follower
 - (iii) Tuned amplifier
 - (iv) Crystal oscillator
 - (v) Multi-vibrator.

