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Question Paper Code : 81232

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Third Semester

Electronics and Communication Engineering

EC 3354 – SIGNALS AND SYSTEMS

(Common to : Computer and Communication Engineering / Electronics Engineering
(VLSI Design and Technology) / Electronics and Telecommunication Engineering /
Medical Electronics)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between continuous and discrete time signal.
2. Find the periodicity of the signal $x(n) = \cos(0.4\pi n)$.
3. Give the relationship between Laplace Transform and Fourier Transform.
4. Write the differentiation and integration property of Laplace transform
5. List the properties of convolution integral.
6. State the initial and final value theorem of Laplace transform.
7. Find the Z transform of $x(n) = \{1, 2, 3, 4\}$.
8. Determine the Nyquist rate of the signal $x(t) = \cos 200\pi t + \sin 400\pi t$.
9. Define recursive and non-recursive systems.
10. Mention the condition for stability in Z-domain.

PART B — (5 × 13 = 65 marks)

11. (a) Determine whether the system $y(n) = x(n+1) + 2x(n) + 5x(n-1)$ is static, linear, time invariant, causal and stable or not.

Or

- (b) A discrete time sequence $x(n) = \{-1, 0.5, 1.5, 1, 2, 3\}$. Determine each of the following sequences.

(i) $x(n+4)$ (3)

(ii) $x(n-3)$ (3)

(iii) $x(0.5n)$ (3)

(iv) $x(2n-2)$ (4)

12. (a) Determine the trigonometric Fourier series over the interval $(-1, 1)$ for the periodic signal defined over one period as $x(t) = t^2$.

Or

- (b) Determine the inverse Laplace transform of the function

$$X(s) = \frac{4}{s^2 + 7s + 10} \text{ for ROCs } \operatorname{Re}(s) < -5 \text{ and } -2 > \operatorname{Re}(s) > -5.$$

13. (a) The system transfer function is given as, $H(S) = \frac{s}{s^2 + 5s + 6}$. The input to the system is $x(t) = e^{-t}u(t)$. Determine the output assuming zero initial conditions.

Or

- (b) Find the impulse response and step response of the system transfer

function given as, $H(S) = \frac{s}{s^2 + 7s + 12}$.

14. (a) State and prove any three properties of discrete time Fourier transform.

Or

- (b) State and prove sampling theorem.

15. (a) For a causal LTI system the input $x(n)$ and output $y(n)$ are related through a difference equation $y(n) - 2y(n-1) - 3y(n-2) = x(n)$. Determine the frequency response $H(e^{j\omega})$ and impulse response $h(n)$ of the system.

Or

- (b) Obtain direct form-I and direct form-II realization of the following system $y(n) = 2y(n-1) - 4y(n-2) + 0.25x(n) + 2.5x(n-1) + 1.5x(n-2)$.

PART C — (1 × 15 = 15 marks)

16. (a) Find the inverse Z transform of $X(z) = \frac{1+2z^{-1}}{1-2z^{-1}+z^{-2}}$ when

(i) $x(n)$ is causal (7)

(ii) $x(n)$ Anticausal (8)

Or

- (b) Evaluate the response $y(t)$ of a continuous time system using Laplace transform with transfer function $H(s) = \frac{1}{s^2 + 5s + 6}$ for an input $x(t) = e^{-t}u(t)$.

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