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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 70087

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Third Semester

Electronics and Communication Engineering

EC 3354 — SIGNALS AND SYSTEMS

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

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State whether the following system y (t) = 2t × (t) is time variant or not.
2. Differentiate between causal and non-causal systems.
3. Define Fourier transform.
4. If $X(s)=\frac{2}{(s+3)}$. Find the Laplace transform of $\frac{dx(t)}{dt}$.
5. Determine the impulse response h (t) of the following system $y(t)=x(t-t_o)$. Assume zero initial conditions.
6. Perform Convolution of the causal signal $x_1(t)=2u(t)$, $x_2(t)=u(t)$ using Laplace transform.
7. Compare Fourier transform of discrete and continuous time signals.
8. State the Linearity property of Z transform.
9. What is a recursive system?
10. In an LTI System the impulse response, $h(n)=C^n$ for n ≤ 0. Determine the range of values of C, for which the system is stable.

PART B — (5 × 13 = 65 marks)

11. (a) Determine the periodicity of the following continuous time signals.

(i) $x(t) = 2 \cos 3t + 3 \sin 7t$ (6)

(ii) $x(t) = 5 \cos 4\pi t + 3 \sin 8\pi t$ (7)

Or

(b) Test whether the system $d^2y(t) / dt^2 + 2\, dy(t)/dt + 3\, y(t) = x(t)$ is linear or not.

12. (a) Derive the fourier transform expression from the exponential form of fourier series.

Or

(b) State and prove initial value theorem and final value theorem using Laplace Transform.

13. (a) Explain the cascade structure and parallel structure of continuous time systems with neat diagram.

Or

(b) Perform convolution of $x_1(t) = e^{-2t} \cos 3t\, u(t)$ and $x_2(t) = 4 \sin 3t\, u(t)$ using Laplace transform.

14. (a) Explain the Correlation property and Parseval's relation in DTFT.

Or

(b) Find the one sided z transform of the discrete time signals generated by mathematically sampling the following continuous time signal $x(t) = e^{-at} \cos \Omega_0 t$.

15. (a) Find the transfer function and unit sample response of the second order difference equation with zero initial conditions $y(n) = x(n) - 0.25y(n-2)$

Or

(b) Find the linear convolution of the sequence, $x(n) = \{-1, 1, \underset{\uparrow}{2}, -2\}$ and $h(n) = \{0.5, 1, \underset{\uparrow}{-1}, 2, 0.75\}$

PART C — (1 × 15 = 15 marks)

16. (a) Using z transform, perform deconvolution of the response, $y(n) = \{1, 4, 8, 8, 3, -2, -1\}$ and impulse response h(n) = {1, 2, 1, -1} to extract the input x(n).

Or

(b) Evaluate the step response of an LTI system whose impulse response, is given by $h(n) = a^{-n} u(-n);\ 0 < a < 1$.