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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 $y(t) = 2t \times (t)$ 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 $y(t) = x(t - t_0)$. 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 $n \leq 0$. 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, $x(n) = \{-1, 1, 2, -2\}$ and $h(n) = \{0.5, 1, -1, 2, 0.75\}$

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 $h(n) = a^{-n} u(-n)$; $0 < a < 1$.