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Question Paper Code: 34404

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Fourth Semester

Electronics and Communication Engineering

01UEC404 – SIGNALS AND SYSTEMS

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Define step signal.
2. Differentiate between deterministic and random signal.
↑
3. State and prove Parseval's theorem for Fourier transform.
4. Give synthesis and analysis equations of continuous time Fourier transform.
5. Define the region of convergence of the Laplace transform.
6. Find the impulse response of two LTI systems when it is connected in parallel?
7. Prove the time shifting property of discrete time Fourier transform.
8. What is aliasing?
9. What is the z-transform of $\delta(n+k)$?
10. List the advantages of the state variable representation of a system.

PART - B (5 x 16 = 80 Marks)

11. (a) Sketch the following type of signals: (i) $u(t-2)$, (ii) $u(t-2)$, (iii) $-3 u(t-2)$ and (iv) $u(-t+1)$. (16)

Or

- (b) Explain the classification of signals in details. (16)

12. (a) (i) Find the exponential Fourier series for the halfwave rectified sinewave with amplitude A and $T = 2\pi$. (8)

- (ii) Explain time and frequency convolution theorems associated with Fourier transform. (8)

Or

- (b) (i) Find the Fourier series for the periodic signal $x(t) = t$ for $0 \leq t \leq 1$ and repeats every one sec's. (12)

- (ii) Find Fourier transform of $x(t) = e^{at} u(-t)$. (4)

13. (a) Obtain the inverse Laplace transform of the function $X(s) = 1/(s^2+3s+2)$, ROC: $-2 < \text{Re}\{s\} < -1$. (16)

Or

- (b) (i) Draw the Direct form I and Direct form II of the following systems differential equations $4 \frac{d^2y(t)}{dt^2} + 5 \frac{dy(t)}{dt} + 2y(t) = 3x(t)$ (10)

- (ii) The LTI system is described by the differential equation $\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$. Obtain the impulse response, if the system is causal. (6)

14. (a) List out and explain any four properties of DTFT. (16)

Or

- (b) Discuss the concept of convolution sum, LTI systems using DIFT. (16)

15. (a) Find the impulse response and step response for the following system
$$Y(n) - 3/4 y(n-1) + 1/8 y(n-2) = x(n). \quad (16)$$

Or

- (b) (i) Find the inverse Z transform of $X(z) = \frac{z^2}{(z-1)(z-0.2)}$ (6)

- (ii) Find the Z transform of the following sequence $\left(\frac{1}{3}\right)^n u(-n)$ and explain about state variable equations. (10)
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