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

Question Paper Code: 41444

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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. Give mathematical representation of continuous and discrete time step response.
3. State Dirichelt's condition.
4. Write the necessary and sufficient conditions for the existence of the Fourier series representation.
5. Find the Laplace transform of $\delta(t-2)$ and $u(t+5)$.
6. State the condition for stability.
7. Prove the time shifting property of discrete time Fourier transform.
8. What is aliasing?
9. State the initial value and final value theorem of Z transform.
10. Find the Z transform of $x(n) = 2^n u(n-2)$.

PART - B (5 x 16 = 80 Marks)

11. (a) Determine whether the following signals are energy or power signal and also calculate their energy and power.

(1) $x(t) = \cos^2(\omega_0 t)$

(2) $x(n) = \left(\frac{1}{2}\right)^n u[n]$. (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) Prove the scaling and time shifting properties of Fourier transform. (8)

(ii) Find the Fourier transform of $f(t) = \sin(\omega_c t + \theta)$ (8)

13. (a) Consider the system H(s) characterized by the differential equation $d^3 y(t) / dt^3 + 6 d^2 y(t) / dt^2 + 11 d y(t) / dt + 6y(t) = x(t)$.

(i) Determine zero state response if $x(t) = e^{-4t} u(t)$

(ii) Find zero input response when $y(0^-) = 1, \quad y'(0^-) = -1, \quad y''(0^-) = 1$

(iii) Find total response of the system. (16)

Or

(b) Determine the inverse Laplace transform of $F(s) = \frac{2s^2 + 3s + 3}{(s+1)(s+3)^3}$ and explain the state variable technique. (16)

14. (a) (i) State and prove the time shift and frequency shift property of DTFT. (8)

(ii) Explain the concept of sampling of CT signals and aliasing. (8)

Or

(b) State and explain sampling theorem and also explain the process of reconstruction of the signal from its samples. (16)

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

Or

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

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