

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--

Question Paper Code: 41043

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2015.

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. Sketch the even and odd samples of $x(n) = (1, 1, 1, 1, 2)$.
↑
2. Give mathematical representation of continuous and discrete time step response.
3. Find Fourier transform of $e^{-at} \cos bt$.
4. Write the necessary and sufficient conditions for the existence of the Fourier series representation.
5. State and prove the differentiation property of Laplace transform.
6. State the condition for stability.
7. What is aliasing?
8. Find linear convolution of $x(n) = \{1, 2, -3, 4, 5, 6\}$ with $y(n) = \{2, -4, 6, -8\}$.
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) Find the following systems determine whether they are linear, timeinvariant, causal and stable or not.

(i) $y(n) = x(n^2)$ (8)

(ii) $y(t) = dx(t)/dt$. (8)

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) The input – output relation of a system are related by

$$d^2 y(t) / dt^2 + 6 dy(t) / dt + 8y(t) = 2 x(t).$$

(i) Find the transfer and impulse function of the system. (8)

(ii) Determine the response of the system if $x(t) = t e^{-2t} u(t)$. (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 $y(0^-)=1, y'(0^-)=-1, y''(0^-)=1$

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

Or

(b) Realize the following system by direct form I, direct form II, cascade and parallel

$$H(S)=S(S+2) / (S+1)(S+3)(S+4). (16)$$

14. (a) State and prove the following properties of discrete time Fourier transform

(i) Time shifting

(ii) Frequency shifting

(iii) Convolution

(iv) Parsevals theorem. (16)

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) Find the state model for the following system

(i)
$$H(Z) = \frac{2 + 4Z^{-1} + 5Z^{-2} + 12Z^{-3}}{1 + 6Z^{-1} + 9Z^{-2} + 10Z^{-3} + 12Z^{-4}}$$
 (12)

(ii) Write any two properties of Z transform. (4)
