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

Question Paper Code: 31344

B.E. / B.Tech. DEGREE EXAMINATION, MAY 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. Find even and odd part of the following DT signals $x(n) = 3 + 2n + 5n^2$.
2. State any two properties of impulse signal.
3. State Dirichlets conditions.
4. Define convolution Integral.
5. Find the differential equation relating the input and output of a CT system represented by $H(S) = \frac{4}{S^2 + 8S + 4}$.
6. Find Laplace transform of $\delta(t-5) and\ u(t+5)$.
7. Define Nyquist rate.
8. State the relation between DTFT and Z transform.
9. Find Z transform of $a^n u(n)$.
10. State the condition for an LTI discrete time system to be causal and stable.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Check the periodicity of the following signal and find its fundamental time period

(i) $x(n)=e^{j6\pi n}$ (ii) $x(t)=2\sin(3t+1)+3\sin(4t-1)$ (8)

(ii) Define energy and power signals and find whether the given signal $x(n)=\left(\frac{1}{3}\right)^n u(n)$ and $x(t) = e^{\,j(\pi/2\,t+\pi/8)}$ are energy and power. (8)

Or

(b) Determine whether the following systems are linear, time invariant, causal and static

(i) $y(t) = x(t)\cos\omega t$

(ii) $y(n) = x^2(-n) + x(n+1)$

(iii) $y(n) = ax(n) + b$

(iv) $y(t) = \frac{dx(t)}{dt}$ (16)

12. (a) (i) State and prove any five properties of Fourier transform. (10)

(ii) Find the response of the system for the input $x(t) = 2e^{-5t}$ using Fourier transform if the impulse response of an LTI system is $h(t) = 2e^{-3t}u(t)$. (6)

Or

(b) (i) Obtain Trigonometric Fourier series for the full wave rectified sine wave. (12)

(ii) Derive the relation between trigonometric Fourier series and exponential Fourier series. (4)

13. (a) (i) Obtain the inverse laplace transform of the function

$X(S) = \frac{1}{S^2+3S+2}$, $ROC: -2 < Re(S) < -1, Re(s) > -1, Re(s) < -2$ (8)

(ii) Obtain the convolution of the following two signals $x(t) = e^{2t}u(t)$ and $h(t) = e^{-5t}u(t)$. (8)

Or

(b) (i) The input *x(t)* and output *y(t)* for a system satisfy the differential equation $\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+4y(t)=6x(t)$. Compute the transfer function and impulse response. (6)

(ii) Draw the direct form, cascade and parallel form representation.

$$\frac{d^2y(t)}{dt^2}+3\frac{dy(t)}{dt}+2y(t)=4\frac{dx(t)}{dt}+x(t) \quad (10)$$

14. (a) State and Explain the sampling theorem for low pass bandlimited signal and explain the process of reconstruction of the signal from its samples. (16)

Or

(b) (i) Find the frequency response and impulse response for the difference equation $y(n) - \frac{1}{6}\, y(n-1) - \frac{1}{6} y(n-2) = x(n)$ (8)

(ii) Find DTFT and plot the spectrum for $x(n)=\left(\frac{1}{2}\right)^n u(n)$ (4)

(iii) Find DTFT for *x(n)* = {1, 2, -3, 1, -2, 1, 3}
↑ (4)

15. (a) (i) Determine the state model of the system governed by the equation

$$y(n) - 3y(n - 1) - 2y(n - 2) = x(n) + 5x(n - 1) + 6\, x(n - 2) \quad (10)$$

(ii) Define ROC and State any four properties. (6)

Or

(b) (i) Determine the impulse response and sketch the ROC for

$H(Z)= \frac{0.2\, Z}{(Z-0.4)(Z-0.2)}$;

(a) |Z| > 0.2,

(b) |Z| < 0.4,

(c) 0.2 < |Z| < 0.4. (6)

(ii) Determine convolution for *x(n)* = {1, 2, -1, 2, 3} and *h(n)* = {1, 2, 3, 0, 1, -2} using graphical method. (10)

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