Reg. No. : ☐☐☐☐☐☐☐☐☐☐

Question Paper Code: 54044

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Electronics and Communication Engineering

15UEC404 - SIGNALS AND SYSTEMS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. x (t/a) is time _____ of signal x(t) by a factor a.

    (a) Compression   (b) Expansion   (c) Shifting   (d) Inversion

2. Fourier transform of $e^{-at} u(t) =$ _____

    (a) $\frac{1}{(s+a)}$ (b) $\frac{1}{(s-a)}$ (c) $\frac{(s-a)}{(s+a)}$ (d) $\frac{(s+a)}{(s-a)}$

3. x(t)=u(t) and h(t)=u(t),then x(t)*h(t)=

    (a) u(t)   (b) tu(t)   (c) $t^2 u(t)$ (d) $t^3 u(t)$

4. The DTFT of unit impulse function is

    (a) 0   (b) 1   (c) 2   (d) 3

5. In Direct Form II _____Delay elements are required to realize third order transfer function in LTI DT System.

    (a) 1   (b) 3   (c) 6   (d) 2

PART - B (5 x 3 = 15 Marks)

6. Plot h(t)=u(t-1)-u(t-3).

7. State Dirichlet's conditions for Fourier series.

8. What are the drawbacks of transfer function method of representing system?

9. List the properties of frequency response of $H(e^{j\omega})$ of an LTI system.

10. Find the Z-transform of the following signal $x[n]=\left(\frac{1}{4}\right)^n u[-n]$.

<div align="center">PART - C (5 x 16 = 80 Marks)</div>

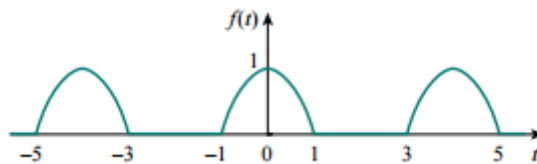11. (a) Find the energy and Power signal of the signal $x(t)=e^{-2t}u(t)$.   (16)

<div align="center">Or</div>

   (b) Explain in detail about stable and unstable systems.   (16)

12. (a) State and prove any five properties of Fourier Transform.   (16)

<div align="center">Or</div>

  (b) Determine the trigonometric Fourier series representation for half wave Rectified cosine signal.

    (16)

13. (a) Find the natural response of an LTI system describe by the following differential equation when the initial conditions are $y(0) = -0.5$ and $\frac{d\,y(0)}{dt} = -1$

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 3\frac{du(t)}{dt} + 2u(t).$$ (16)

<div align="center">Or</div>

   (b) Find the Inverse Laplace transform of $X(S) = (2S+1)/(S+1)(S^2+2S+2)$.   (16)

14. (a) Find the frequency response of a I order system described by difference equation $y(n) = a\,y(n-1) + x(n)$. Plot magnitude and phase response for $a = 0.5$.   (16)

<div align="center">Or</div>

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(b) Use the tables of transforms and properties to find the DTFT's of the following signals

(i) $x[n] = \left(\frac{1}{3}\right)^n u[n+2]$ (8)

(ii) $x[n] = \cos(\frac{\pi}{4}n)\left(\frac{1}{2}\right)^n u[n-2]$ (8)

15. (a) Obtain a parallel realization of a system characterized by the transfer function

$$H(z) = \frac{z^3+z^2-z+1}{(z+1)(z^2+2z+3)}$$ (16)

Or

(b) Use the unilateral z-transform to determine the forced response, the natural response, and the complete response of the systems described by the following difference equation $y[n] - \frac{1}{9}y[n-2] = x[n-1]$ with initial conditions $y[-1] = 1$ & $y[-2] = 0$ and input $x[n] = 2u[n]$. (16)

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