**Code: 15A04303**

**R15**

B.Tech II Year I Semester (R15) Supplementary Examinations June 2017

**SIGNALS & SYSTEMS**

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

**PART – A**

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) State the relation between step, ramp and delta functions (CT).

(b) Define Quadrature Fourier Series.

(c) Define memory and memory less system.

(d) State Sampling theorem and aliasing

(e) The impulse response of the LTI CT system is given as h(t) = e-t u(t). Determine transfer function and check whether the system is causal and stable.

(f) List the applications of FFT.

(g) If u(n) is the impulse response of the system, What is its step response?

(h) Determine the discrete-time convolution sum of the given sequences: x(n) ={1, 2, 3, 4} and h(n)= {1, 5, 1}

(i) Define Bilateral and unilateral Laplace transform.

(j) What are the properties of ROC?

**PART – B**

(Answer all five units, 5 X 10 = 50 Marks)

**UNIT – I**

2 (a) Define a signal and a system. With neat sketches for illustration, briefly describe the five commonly used methods of classifying signals based on different features.

(b) Find the trigonometric Fourier series representation of a periodic signal x(t) = t, for the interval of t = -1 to t = 1.

**OR**

3 (a) Distinguish between: (i) Deterministic and random signals. (ii) Energy and periodic signals. Give examples.

(b) Find the exponential Fourier series for half wave rectified sine wave.

**UNIT – II**

4 (a) Show that the product of two even signals or two odd signals is an even signal and that the product of an even and an odd signal is an odd signal.

(b) Write any four properties of FT with proofs.

**OR**

5 (a) Find the convolution integral of x(t) and h(t), and sketch the convolved signal:

x(t) = (t -1){u(t -1) +u(t -3)} and h(t)= [u(t +1) - 2u(t -2)].

(b) Discuss about sampling theorem of low pass signals.

**UNIT – III**

6 (a) What do you mean by impulse response of an LTI system? Deduce the equation for the response of an LTI system, if the input sequence x(n) and the impulse response are given.

(b) The input x ( t ) and the impulse response h (t) of a continuous time LTI system are given by:

$x(t) = u(t) \qquad h(t) = e^{-\alpha t}u(t), \alpha > 0$

Compute the output y(t).

**OR**

7 (a) Explain any four properties of continuous and/or discrete time systems. Illustrate with suitable examples.

(b) Determine the discrete-time convolution sum of the given sequences. x(n) ={1, 2, 3, 4} and h(n)= {1, 5, 1}.

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**UNIT – IV**

8 (a) Define the DTFT of a signal. Establish the relation between DTFT and Z transform of a signal.

(b) Determine the discrete time Fourier transform of $x[n] = a^n u(n)$ for $-1 < a < 1$.

**OR**

9 (a) Find the DTFT of the sequence $x(n) = (1/3)^n u(n+2)$ and determine magnitude and phase spectrum.

(b) One period of the DTFS coefficients of a signal is given by: $x(k) = (1/2)^K$ on $0 < K < 9$. Find the time-domain signal x(n) assuming N = 10.

**UNIT – V**

10 (a) Determine system transfer function and impulse response of discrete time system described by the difference equation: y(n)-5/6 y(n-1)+1/6y(n-2) = x(n)-1/2x(n-1).

(b) A system has impulse response $\mathrm{h(n)} = \left(\frac{1}{2}\right)^2 u(n)$, determine the input to the system if the output is given by: $\mathrm{y(n)} = \frac{1}{3}\mathrm{u(n)} + \frac{2}{3}\left(-\frac{1}{2}\right)^n u(n)$.

**OR**

11 (a) Find the z-transform of the signal along with ROC: $x(n) = n \sin\left(\frac{\pi}{2}n\right) u(n)$.

(b) Solve the following difference equation using unilateral z-transform :
$\mathrm{y(n)} - \frac{3}{2}\mathrm{y(n-1)} + \frac{1}{2}y(n-2) = x(n), for\ n \geq 0$, with initial conditions y(-1) = 4, y(-2) = 10 and $x(n) = \left(\frac{1}{4}\right)^n u(n)$.

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