Code: 13A04302 **R13**

B.Tech II Year I Semester (R13) 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) Find the even and odd components of the following signal x(t) = cost + sint + sint cost.
(b) What are the conditions for a system to be LTI system?
(c) Write short notes on Dirichlets conditions for Fourier series.
(d) State and prove symmetry property of Fourier series.
(e) Explain how Aperiodic signals can be represented by Fourier transform.
(f) State convolution property in relation to Fourier transform.
(g) State sampling theorem.
(h) Give the system impulse response h(t). State the conditions for stability and causality.
(i) State modulation property and multiplication in Fourier transform.
(j) What are the properties of ROC in z transform?

PART – B

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

UNIT – I

2 (a) Consider a rectangular pulse as shown by the equation $x(t) = \begin{cases} A; & -0.5 < t < 0.5 \\ 0; & otherwise \end{cases}$. Express $x(t)$ as a weighted sum of two step functions.

(b) Explain the various operations on signals.

OR

3 (a) Write the Classification of systems based on certain properties.

(b) The I order system is described by the following difference equation y[n] = ay[n-1] + x[n] and has the impulse response h[n] = a^n u[n]. Is this system casual, memory less or BIBO stable?

UNIT – II

4 (a) Find the Fourier series for $|x|$, $-\pi < x < \pi$.

(b) Find the exponential form of the Fourier series for the signal $x(t) = 2 + 4\sin(\frac{1}{2}t + \frac{\prod}{6}) + 3\cos(\frac{3}{5}t - \frac{\prod}{4})$

OR

5 (a) Find the cosine Fourier series of a half wave rectified sine function.

(b) State and prove convolution property in Fourier series.

UNIT – III

6 (a) Determine Fourier transform of an impulse train.

$$x(t) = \sum_{n} \delta(t - nT).$$

(b) Determine DTFT of the following signal: x(n) = 4(2^n) u(n).Find the magnitude.

OR

7 (a) Find the inverse DTFT of X(e^{jw}) = 2sin2w, -Π < w < V.

(b) Determine CTFT of the following signal. $x(t) = \begin{cases} A; & for \ -\tau/2 \le t \le \tau/2 \\ 0; & elsewhere \end{cases}$.

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UNIT – IV

8 The input and output of a causal LTI system are related by the differential equation:

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

(i) Find the impulse response of the system.

(ii) What is the response of this system if $x(t) = t\, e^{-2t}\, u(t)$

OR

9 Compute & plot the convolution y(t) of the given signals:

(i) X(t) = u(t-3) – u(t-5), h(t) = u(t).

(ii) X(t) = u(t), h(t) = u(t).

UNIT – V

10 The system function of the LTI system is given as $H(Z) = (3-4(Z^{-1})) / (1 - 3.5Z^{-1} + 1.5Z^{-2})$. Specify the ROC of H(Z) and determine h(n) for the following condition: (i) Stable system. (ii) Causal system.

OR

11 A system is described by the differential equation:

$d^2y(t)/dt^2+3dy(t)/dt + 2y(t) = dx(t)/dt$ if y(0) = 2; dy(0)/dt = 1 and $x(t) = e^{-t}\, u(t)$

Use Laplace transform to determine the response of the system to a unit step input applied at t = 0.

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