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BT-3 / D-17

SIGNALS AND SYSTEMS

Paper–ECE–201N opt. (I)

me allowed : 3 hours] *[Maximum marks : 75*

ote : Candidates have to attempt five questions in total choosing five questions from four units selecting atleast one from each unit.

Unit–I

. (a) Find the even and odd components of each of the following signals:

(i) $x(t) = \cos(t) + \sin(t) + \sin(t)\cos(t)$

(ii) $x(t) = 1 + t + 3t^2 + 5t^3 + 9t^4$.

(iii) $x(t) = 1 + t\cos(t) + t^2\sin(t) + t^3\sin(t)\cos(t)$

(iv) $x(t) = (1 + t^3)\cos^3(10t)$ 4×2=8

(b) Taking suitable examples of a system, explain the linearity, time invariant, causality and memory properties of it. 7

2. A discrete time system has impulse response:

$$h[n] = \cos\left(\frac{\pi}{2}n\right)U[n+3]$$

for this system derive and check the following conditions:

3×5 = 15

(a) stable (b) Causal (c) Memoryless

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Unit–II

3. (a) What do you mean by convolution and correlation of signals? In terms of graphical interpretation, explain the difference between the convolution and correlation operations. 10

(b) Find the correlation between x (t) and y (t), given that $x(t) = 3\cos w_o t$ and $y(t) = 2\cos w_o t$ 5

4. Determine the impulse response of a low pass RL filter. 15

Unit–III

5. Derive an expression for sampling. Also determine the minimum sampling frequency to be used to sample the signal $x(t) = 100\,\text{sinc}^2 100t$, if the signal x (t) is to be recovered from the samples without any distortion.

6. What is CTFS and DTFS? Discuss their properties. 15

Unit–IV

7. (a) Find out CTFT of the following signal: 8

$x(t) = \sin(2\pi t)e^{-t}u(t)$

(b) Discuss the properties of CTFT. 7

8. Determine the Laplace transformation and inverse Laplace transformation of the following signal: 15

$x(t) = e^{at}u(t)$

$$X(s) = \frac{7S+10}{S(S+2)}$$

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