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Barasat, Kolkata -700125

Term End Examination 2022
Programme – B.Tech.(RA)-2021
Course Name – Signal and Systems
Course Code - PCC-ECR303
(Semester III)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :
- (i) The Fourier transform of a conjugate symmetric function is
 - a) imaginary
 - b) real
 - c) conjugate asymmetric
 - d) conjugate symmetric
 - (ii) The period of the signal $x(t)=10\sin(12\pi t) + 4\cos(18\pi t)$ is
 - a) $\pi/4$
 - b) $1/6$
 - c) $1/9$
 - d) $1/3$
 - (iii) A signal is a physical quantity which does not vary with _____
 - a) time
 - b) space
 - c) independent variables
 - d) dependent variables
 - (iv) Which one of the following is not a characteristic of a deterministic signal?
 - a) exhibits no uncertainty
 - b) instantaneous value can be accurately predicted
 - c) exhibits uncertainty
 - d) can be represented by a mathematical equation
 - (v) The signal $y(t) = t[x(t)]$ is
 - a) linear and time invariant system
 - b) linear and time variant system
 - c) non-linear time invariant system
 - d) non-linear time variant system
 - (vi) What is the value of $u(1)$, where $u(t)$ is the unit step function?
 - a) 1
 - b) 0.5
 - c) 0
 - d) -1
 - (vii) The system $y(t+2) + y(t+1) = x(t+2)$ is
 - a) causal and memory less
 - b) causal and has memory
 - c) causal
 - d) not causal
 - (viii) A system is described as $y(t) = x(2t)$, the system is

- a) time variant
c) static
- (ix) Determine the odd component of the signal $x(t) = t^2 + \sin t$. (Here " \wedge " denotes "to the power").
- a) $\sin t$
c) $\cos t$
- (x) Energy of a periodic signal is
- a) finite
c) 1
- (xi) Which mathematical notation specifies the condition of periodicity for a discrete time signal?
- a) $x(t) = x(t + T)$
c) $x(t) = e^{\wedge(-T)t}$. (Here " \wedge " denotes "to the power").
- (xii) Which among the following operation is involved with the computation process of linear convolution?
- a) folding operation
c) multiplication operation
- (xiii) What is the possible range of frequency spectrum for discrete time Fourier series?
- a) 0 to 2π
c) both
- (xiv) All real time systems concerned with the concept of causality are
- a) non causal
c) neither causal nor non causal
- (xv) ROC of unit step function is
- a) $|z| < 1$
c) $|z| = 1$
- b) time invariant
d) none of these
- b) $2\sin t$
d) $2\cos t$
- b) infinite
d) none of these
- b) $x(n) = x(n + N)$
d) none of these
- b) shifting operation
d) All of above
- b) $-\pi$ to $+\pi$
d) none of these
- b) causal
d) memory less
- b) $|z| > 1$
d) none of these

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Complete the non-linearity property of a system. (3)
3. Develop the convolution of two sequences using Z-transformation: $x_1(n) = \{1, 2, -1, 0, 3\}$; $x_2(n) = \{1, 2, -1\}$ (3)
4. Explain the basic steps to compute the convolution sum. (3)
5. Conclude the properties of ROC of Laplace transform. (3)
6. Estimate the energy of signal sequence given by $x(t) = e^{\wedge(2t)} u(t)$. (Here " \wedge " denotes "to the power"). (3)

OR

Associate sampling theorem and aliasing effect.

(3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Describe even and odd signals, even and odd components of the step signal. (5)
8. From the given impulse response $h(t) = e^{\wedge t} u(t)$, calculate the causality & stability of the system. (Here " \wedge " denotes "to the power"). (5)
9. Explain in detail about the properties of z-transform. (5)
10. Discover causal system, Laplace transform and ROC of the signal $x(t) = e^{\wedge(-3t)} u(-t) + e^{\wedge(-2t)} u(-t)$. (Here " \wedge " denotes "to the power"). (5)

OR

Illustrate the following signals: (i) unit sample signal (ii) unit step signal (iii) unit ramp signal. (5)

11. Organize the properties of Laplace transform. (5)

OR

Classify properties of continuous time Fourier transform. (5)

12. Argue that a LTI system is completely characterized by its unit sample response. (5)

OR

Compare static and dynamic system. (5)

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