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5E5021

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B.Tech. V Semester (Main&Back) Examination, Nov./Dec. - 2017
Electronic Instrumentation & Control Engg.
5EI1 A Signals & Systems
Common with EC

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates :

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

Unit - I

1. Differentiate following: $(4 \times 4 = 16)$

   a) Continuous-time and discrete-time signals.

   b) Continuous-valued and discrete-valued signals.

   c) Multichannel and Multidimensional Signals.

   d) Deterministic and Random Signals.

OR

1. For the following input output relationships, determine whether the corresponding system is linear or not

   a) $y(t) = x^2(t)$ (8)

   b) $y(n) = 2x(n) - 3$ (8)

Unit - II

2. Write and Explain all the properties of Continuous-Time Fourier series.   (16)

OR

2. a) Given the Periodic waveform $x(t) = t^2$, $0 < t < 1$ Determine the exponential Fourier series and plot the magnitude and phase spectra.   (8)

   b) Find the time-domain signal corresponding to the Discrete Periodic waveform $X_k = \cos(k4\pi/11) + 2j\sin(k6\pi/11)$.   (8)

Unit - III

3. Find the Fourier transform of the following :
   a) $x(t) = \cos(\omega_0 t)$ (5)
   b) Unit step function $u(t)$ (5)
   c) Continuous time signal $x(t) = e^{-at} u(t)$, $a > 0$ (6)

OR

3. Explain the following properties of Fourier transform along with proof
   a) Convolution property (5)
   b) Modulation property (5)
   c) Duality (6)

Unit - IV

4. Determine the Laplace transform of
   a) A unit Impulse function $x(t) = \delta(t)$ (5)
   b) A unit step function $x(t) = u(t)$ (5)
   c) A unit ramp function $x(t) = r(t)$ (6)

OR

4. a) Write and Explain the Initial value theorem and final value theorem with proof. (8)
   b) Determine the Z–Transform of the following:
      i) $x(n) = -u(-n-1)$ (4)
      ii) $x(n) = u(-n)$ (4)

Unit - V

5. Specify the Nyquist rate and Nyquist interval for each of the following signals
   a) $x(t) = \text{sinc}(200t)$ (5)
   b) $x(t) = \text{sinc}^2(200t)$ (5)
   c) $x(t) = \text{sinc}(200t) + \text{sinc}^2(200t)$ (6)

OR

5. Explain following in detail.
   a) Sampling of sinusoidal signals. (8)
   b) Sampling theorem for Low-pass signals. (8)

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