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[5352]-131

S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2018

SIGNALS AND SYSTEMS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B.** :— (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- (ii) Use of non-programmable calculator is allowed.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
- (v) Assume suitable data, if necessary.

Q.1) A) Determine if the following systems described by $y(t) = \sin[x(t+2)]$ are
1. Static/Dynamic 2. Linear/Nonlinear 3. Time invariant/ Time variant [6]
4. Causal/Non-causal

B) Find the following linear convolution sum
If $x(n) = \{2, 3, 1, 4\}$ $h(n) = \{-1, 2, 3\}$
 $\uparrow \qquad \qquad \qquad \uparrow$
And $y(n) = x(n) * h(n)$ [3]

C) Determine whether the following LTI system described by impulse
Response $h(t) = e^{-t}u(t+1)$ is stable and causal. [3]

OR

Q.2) A) Find the convolution Integral of following signal $x(t) = u(t)$
And $h(t) = 1$ for $-1 \leq t \leq 1$. [6]

P.T.O.

B) Find whether the following signal is energy or power. Find

Appropriate value

$$x(t) = 4 \cos\left(\frac{\pi}{4}t\right) \quad \text{for} \quad -\frac{1}{2} \leq t \leq \frac{1}{2} \quad [6]$$

Q.3) A) State and prove the following properties of Laplace Transform.

i) Integration in time domain ii) Time shifting in time domain [6]

B) Find the Quadrature Fourier series for the given signal $x(t) = \sin\omega_0 t$. [6]

OR

Q.4) A) State conditions for the existence of Fourier Transform. Find

fourier transform of the given signal $y(t) = e^{-at}u(t)$. [6]

B) Find the Laplace transform of the following signal with ROC:

1) $x(t) = e^{3t}u(t) + e^{-t}u(-t)$. 2) $x(t) = 5e^{-3t} \sin(2t)$. [6]

Q.5) A) State and Describe the properties of Energy Spectral Density.(ESD) [6]

B) Calculate the ESD, total energy of a signal $x(t) = A \text{sinc}(2Wt)$ [7]

OR

Q.6.A) State and Describe properties of cross-correlation of the CT energy signals. [6]

B) Find the auto correlation using basic autocorrelation equation of the following signals.

$x_1[n] = [4, 3, 2, 1]$ $x_2[n] = u[n]$ [7]

Q.7.A) Explain probability distribution model of Binomial distribution. [3]

B) If A and B are two events such that $p(A) = 0.3$, $p(B) = 0.4$, $p(A \cap B) = 0.2$

Find i) $p(A \cup B)$ ii) $p(\bar{A}/B)$ [4]

C) The probability that a student gets A grade, B grade, C grade, D grade and E grade in a course are 0.2, 0.3, 0.15, 0.25 and 1.0 respectively. What are the probabilities that he/she gets i) A, B or C grade ii) B, C or D grade. [6]

OR

Q.8) A) A certain random variable has the CDF given by: [6]

$$\begin{aligned}F_X(x) &= 0, & \text{for } x \leq 0 \\ &= kx^2, & \text{for } 0 < x \leq 10 \\ &= 100k, & \text{for } x > 10.\end{aligned}$$

- 1) Calculate the value of k.
- 2) Find the values of $P(x \leq 5)$ and $P(5 < x \leq 7)$.
- 3) Plot the corresponding PDF.

B) State the properties of probability density function. [3]

C) Find the mean and variance of uniform distribution function. [4]