R16

Code No: 133BQ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2017
SIGNALS AND STOCHASTIC PROCESS
(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Write about unit step function and unit impulse function. [2]
b) Define signal bandwidth and system bandwidth. [3]
c) Determine the complex exponential Fourier series representation for $x(t) = \cos\left(2t + \frac{\pi}{4}\right)$. [2]
d) Find the Fourier transform of $x(t) = e^{j\omega_0 t}$. [3]
e) Find the Laplace transform of $x(t) = -e^{at}\, u(-t)$. [2]
f) Write the differences between the continuous-time signal $e^{j\omega_0 t}$ and the discrete-time signal $e^{j\omega_0 n}$. [3]
g) Explain about second order stationary process. [2]
h) Explain about Cross- Covariance function. [3]
i) Define Cross-Power Spectrum function. [2]
j) Find auto correlation function for $S_{XX}(\omega) = \frac{8}{(9+\omega^2)^2}$. [3]

PART-B

(50 Marks)

2.a) Define orthogonal signal space and orthogonal vector space. Bring out clearly its applications in representing a signal and vector respectively.
b) Explain how functions can be approximated using orthogonal functions. [5+5]

OR

3.a) Derive the relationship between rise time and bandwidth.
b) State and Prove the Convolution property of Fourier transform. [5+5]

4.a) Expand following function f(t) by trigonometric Fourier series over the interval (0,1). In this interval f(t) is expressed as f(t) = At
b) State and prove multiplication property of continuous time Fourier series. [5+5]

OR

5.a) Find the Fourier transform of symmetrical gate pulse and sketch the spectrum.
b) State and prove sampling theorem for band limited signals using analytical approach. [5+5]

6.a) State and prove the properties of ROC of Laplace transform.
b) Find the inverse Laplace transform of $X(s) = \frac{5s+13}{s(s^2+4s+13)}$, $Re(s) > 0$. [5+5]

OR

7.a) Find X(z) and sketch the zero-pole plot and the ROC for $a < 1$ and $a > 1$ for the signal $x[n] = a^{|n|}$.
b) Determine the inverse Z transform of $X(z) = \log\left(\frac{1}{1-az^{-1}}\right)$; ROC $|z| > |a|$. [5+5]

8.a) Explain briefly about Gaussian and Poisson Random Process.

b) Show that the random process $X(t) = A\cos(\omega_0 t + \theta)$ is wide-sense stationary if it is assumed that A and ω_0 are constants and θ is a uniformly density random variable over the interval $(0,2\pi)$. [5+5]

OR

9.a) Explain about Auto-correlation function with their properties.

b) Show that mean square value of output response is independent of time t. [5+5]

10. Explain about cross power spectrum density and its properties with proofs. [10]

OR

11. Derive the relationship between cross-power spectrum and cross correlation function. [10]

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