Code No: 133BQ

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, April/May - 2018
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)   What is meant by Total response?   [2]
  b)   Define Unit step function and Signum function.   [3]
  c)   State "time shift" property of Fourier transform.   [2]
  d)   Define aliasing effect? How can you overcome?   [3]
  e)   What is the time shifting property of Z transform?   [2]
  f)   Define inverse Laplace transform. State the linearity property for Laplace transforms.
                                                                                                              [3]
  g)   Give an example of evolutionary random process.   [2]
  h)   List the properties of Cross correlation function.   [3]
  i)   Define wiener khinchine relations.   [2]
  j)   State any two properties of cross-power density spectrum.   [3]

PART-B
(50 Marks)

2.   Define the error function while approximating signals and hence derive the expression for
        condition for orthogonality between two waveforms $f_1(t)$ and $f_2(t)$.   [10]
OR
3.   Obtain the impulse response of an LTI system defined by $dy(t)/dt + 2y(t) = x(t)$. Also
        obtain the response of this system when excited by $e^{-2t} u(t)$.   [10]

4.   State and prove sampling theorem for band limited signals.   [10]
OR
5.a)   State and prove Differentiation and integration properties of Fourier Transform.
  b)   Obtain the expressions to represent trigonometric Fourier coefficients in terms of
       exponential Fourier coefficients.   [5+5]

6.   Determine the inverse Laplace of the following functions.
        a) 1/s(s+1) (s+3)   b) $3s^2+8s+6$ / (s+8) (s^2+6s+1).   [5+5]
OR
7.a)   Find the Inverse Z transform of

$$X(z) = \frac{z+2}{4z^2 - 2z+3} \; ; \; |z| < \sqrt{\frac{3}{4}}$$

  b)   Find the Z transform of x [n] = a^{n+1} u [n+1].   [5+5]

8.a) X(t) is a random process with mean =3 and Autocorrelation function
$R_{xx}(\tau) = 10[\exp(-0.3|\tau|)+2]$. Find the second central Moment of the random variable
Y=X(3)-X(5).

b) X(t)=2ACos(W$_c$t+2θ) is a random Process, where 'θ' is a uniform random variable, over
(0,2π). Check the process for mean ergodicity.   [5+5]

OR

9.a) A random process is defined as X(t) = A Cos(ω$_o$t +Θ), where Θ is a uniformly distributed
random variable in the interval (0,π/2). Check for its wide sense stationarity? A and ω$_o$
are constants.

b) Given the auto correlation function for a stationary ergodic process with no periodic
components is $R_{XX}(\tau) = 25+4/(1+6\tau^2)$. Find mean and variance of process X(t).   [5+5]

10.a) Compare and contrast Auto and cross correlations.

b) If Y(t) = A Cos(w$_0$t+θ)+N(t), where 'θ' is a uniform random variable over (-π,π), and
N(t) is a band limited Gaussian white noise process with PSD=K/2. If 'θ' and N(t) are
independent, find the PSD of Y(t).   [5+5]

OR

11. Given $R_{XX}(\tau) = Ae^{-\alpha|\tau|}$ and $h(t) = e^{-\beta t} u(t)$ where $u(t) = \begin{cases} 1; & t \geq 0 \\ 0; & otherwise \end{cases}$. Find the spectral

density of the output Y (t).   [10]

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