Code No: 113AW

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, May/June - 2015
SIGNALS AND SYSTEMS
(Common to ECE, EIE, BME)

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.   [2M]
  b)   What are Dirichlet conditions?   [3M]
  c)   State Duality Property of Fourier Transform.   [2M]
  d)   State Sampling Theorem.   [3M]
  e)   What is Paley-Wiener Criterion?   [2M]
  f)   Define Signal Bandwidth and System Bandwidth.   [3M]
  g)   Write any two properties of Correlation function.   [2M]
  h)   Write relation between convolution and correlation.   [3M]
  i)   Find the Laplace Transform of unit ramp function.   [2M]
  j)   What is the relationship between z-transform and DTFT?   [3M]

PART-B   (50 Marks)

2.a)   Verify the following signals $\sin n\omega_0 t$ and $\sin m\omega_0 t$ are orthogonal not over the
        interval $(t_0,\ t_0 + 2\pi/\omega_0)$.
  b)   Define the following elementary signals:
        i) Real exponential signal.
        ii) Continuous time version of a sinusoidal signal and bring out the relation
        between sinusoidal and complex exponential signals.   [5+5]
                                    OR
3.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)   Prove that discrete magnitude spectrum is symmetrical about vertical axis where
        as phase spectrum anti-symmetrical about vertical axis.   [5+5]

4.a)   Find the Fourier transform of symmetrical gate pulse and sketch the spectrum.
  b)   State and prove following properties of Fourier transform:
        i) Time shifting.
        ii) Differentiation in time domain.   [5+5]
                                    OR
5.a)   State and prove sampling theorem for band limited signals using analytical
        approach.
  b)   Give introduction to band pass sampling.   [5+5]

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6.a) Derive the relationship between rise time and bandwidth.
  b) Sketch the frequency response of ideal LPF, HPF and BPF. [5+5]

OR

7.a) What is a distortionless system? Explain.
  b) Check whether the following systems are linear or not.

  i) $\dfrac{dy(t)}{dt} + 2y(t) = x^2(t)$

  ii) y(n) = A x(n) + B; where A and B are constants. [5+5]

8.a) Prove that the correlation and convolution functions are identical for even Signals.
  b) Explain about graphical procedure to perform convolution. [5+5]

OR

9.a) Explain detection of periodic signals in the presence of noise by Correlation.
  b) Compare autocorrelation and cross correlation in detail with example. [5+5]

10.a) Find Laplace transforms and sketches their ROC of:
  i) x(t) = u(t-5)
  ii) $x(t) = e^{j\omega t} u(t)$.

  b) Find the inverse Laplace transform of X(s) = (-5s-7)/(s+1)(s-1)(s+2). [5+5]

OR

11.a) Determine z - transform, pole - zero locations and sketch the ROC of following signal $x(n) = -u(-n-1) + (1/2)^n u(n)$.

  b) Find the inverse z - transform of X(z) = (2+z^{-1})/(1-0.5z^{-1}) with ROC $|z| > \dfrac{1}{2}$ using power series expansion. [5+5]

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