C 26882 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
MAY 2012

EE 09 403/PTEE 09 402—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 70 Marks

Part A

All questions are compulsory :

1. Define energy and power signals.
2. State Parseval's Theorem for CT Fourier Series
3. What is nyquist rate ?
4. Find the Fourier Transform $e^{at}\ u(t)$
5. Determine the inverse z transform $X(z) = 1/z\text{-}a$

(5 × 2 = 10 marks)

Part B

Answer any *four* questions :

1. Sketch the following signals

   (i) $r\ (t)\ u\ (2\text{-}t)$. (2.5 marks)

   (ii) $r\ (t) - 2r\ (t-1) + r\ (t-2)$. (2.5 marks)

2. Determine $y\ (t)$ by convolution integral if $x\ (t) = e^{at}\ u(t)$ and $h(t) = u(t)$.
3. Determine the continuous time signal of the following transforms :

   $X\ (jw) = \cos\ (4w + \prod /3)$

4. Find the Z transform of the following sequence :

   $x[n] = u[n\text{-}2] - 5u[n + 3]\text{-}u\ [n]$.

5. Determine the pole zero plot and ROC of the given equation :

   $X[n] = -a^n u[n\text{-}1]$

6. Verify the causality and time invariance of the system $y\ (n + 2) = ax\ (n + 1) + bx\ (n + 3)$.

(4 × 5 = 20 marks)

Turn over

Part C

1 (a) Check whether the given system is stable or dynamic, linear or non-linear, causal or non-casual, time-invarient or time -varient

$d^3y(t)/dt^3 + 4d^2y(t)/dt^2 + 5dy(t)/dt + 2y(t) = x(t)$.

Or

(b) Explain the Classification of signals with examples.

2 (a) A system is described by the differential equation,

$d^2y(t)/dt^2 + 3dy(t)/dt + 2y(t) = dx(t)/dt$

if $y(0) = 2$; $dy(0)/dt = 1$ and $x(t) = e^{-t}u(t)$

Determine the response of the system to a unit step input applied at t = 0.

Or

(b) Define exponential Series and derive the Fourier coefficients with example.

3 (a) Find the DTFT of :

(i) $x[n] = 2n\ u[n]$ (4 marks)

(ii) $x[n] = (0.5)^{n+2-n}\ u[-n-1]$ (6 marks)

Or

(b) State and Prove Sampling Theorem

4 (a) Determine the inverse z transform of the following function :

(i) $x(z) = 1/(1 + z^{-1})(1-z^{-1})2$ ROC : $|Z > 1|$ (7 marks)

(ii) $X(z) = 1/z\text{-}a$, $|z| > |a|$ (3 marks)

Or

(b) Consider an LTI system for which the input x[n] and output y[n] satisfy the linear constant difference equation :

$Y[n]\text{-}1/2\ y[n\text{-}1] = x[n] + 1/3\ x[n\text{-}1]$.

Find H(z) with ROC $|Z > 1/2|$.

(4 × 10 = 40 marks)