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Name.....

Reg. No.....

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

EE 09 403/PTEE 09 402—SIGNALS AND SYSTEMS

Time : Three Hours

Total Marks 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 $X(z) = 1/z-a$

(5 × 2 = 10 marks)

Part B

Answer any four questions :

1. Sketch the following signals

(i) $r(t) u(2-t)$.

(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 :

$$X(j\omega) = \cos(4\omega + \pi/3)$$

4. Find the Z transform of the following sequence :

$$x[n] = u[n-2] - 5u[n+3] - u[n].$$

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

$$X[n] = -a^n u[n-1]$$

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-causal, time-invariant or time-variant

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

Or

- (b) Explain the Classification of signals with examples.
- 2 (a) A system is described by the differential equation,

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

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

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) $X(z) = 1/z-a, |z| > |a|$

(3 marks)

Or

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

$$Y[n] - 1/2 y[n-1] = x[n] + 1/3 x[n-1].$$

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

(4 × 10 = 40 marks)