

C 40946

(Pages : 3)

Name.....

Reg. No.....

**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
APRIL 2013**

**EE 09 403/PT EE 09 402—SIGNALS AND SYSTEMS
(2009 Scheme—Regular/Supplementary/Improvement)**

Time : Three Hours

Maximum : 70 Marks

Part A

All questions are compulsory.

1. Check whether the following system is linear or causal $y(t) = x(t^2)$.
2. State the convolution property of Fourier transform.
3. State sampling theorem.
4. What are the properties of region of convergence.
5. State initial value theorem of Z-transform.

(5 × 2 = 10 marks)

Part B

Answer any four questions.

1. Sketch and label the following signals :

- (a) $x(2t + 1)$ (1 mark)
- (b) $[x(t) + x(-t)]u(t)$ (1 mark)
- (c) $X(4 - t/2)$ (1 mark)
- (d) $X[n - 1]^2$ (1 mark)
- (e) $X[n]u[3 - n]$ (1 mark)

2. State and prove Parseval's power theorem and Rayleigh's energy theorem
3. Find the frequency response of the following causal system :

$$y[n] = \frac{1}{2}x[n] + x[n - 1].$$

Turn over

4. Find the z-transform of $x(n) = a^n u(n-1)$.
5. Find whether the following signal is periodic or not, determine its fundamental period :

$$x(t) = [\cos(2t - \pi/3)]^2.$$

6. Find the DTFT of the following :

$$x[n] = 5n u[n].$$

(4 × 5 = 20 marks)

Part C

1. (a) Determine whether the following systems are static or Dynamic, Linear or Non-linear, Shift variant or Invariant, Causal or Non-causal, Stable or unstable

$$y(t) = x(t+10) + x(t).$$

(5 marks)

$$dy(t)/dt + 10y(t) = x(t).$$

(5 marks)

Or

- (b) Explain the Classification of signals with examples.

2. (a) State and prove properties of Fourier transform.

Or

- (b) For the Laplace transform of

$$x(t) = \begin{cases} e^t \sin 2t & t \leq 0 \\ 0 & t > 0 \end{cases}$$

indicate the location of its poles and its region of convergence.

3. (a) Determine the Fourier transform of the discrete time rectangular pulse of amplitude A and length L i.e. $x[n] = A$ for $0 \leq n \leq L-1$ otherwise.

Or

- (b) Consider a causal Discrete time LTI system whose input $x[n]$ and output $y[n]$ are related by the difference equation :

$$Y[n] - \frac{1}{4}y[n-1] = x[n]. \text{ Find the Fourier series representation of output } y[n] \text{ if } x[n] = \sin(n3\pi/4).$$

4. (a) State and prove the time delay theorem of z-transform.

Or

(b) Determine the inverse z-transform of the following function :

(i) $x(z) = 1 / (1 + z - 1)(1 - z - 1)^2$ ROC: $|Z| > 1$ (6 marks)

(ii) $x(z) = 1 / (1 - 9z^{-1})$ (4 marks)

[4 × 10 = 40 marks]

