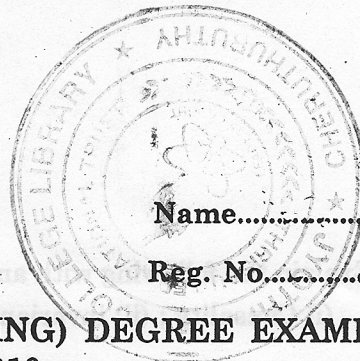


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Name.....

Reg. No.....

**THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
DECEMBER 2010**

EC 09 304/PTEC 09 303—SIGNALS AND SYSTEMS

(2009 admissions)

Time : Three Hours

Maximum : 70 Marks

✓ **Part A**

1. What is meant by energy signal ?
2. What is BIBO stability ?
3. Define Hilbert transform.
4. What is inverse system ?
5. What is meant by ROC of z-transform ?

(5 × 2 = 10 marks)

Part B

Answer any four questions.

6. Check whether the system having the following input-output relation is linear time invariant
 $y(t) = 5x(t) + 2$.
7. State and prove convolution property of Fourier transform.
8. Find the discrete Fourier series representation of the periodic sequence
 $x(n) = \{1, 1, 0, 0\}$
with period $N = 4$.
9. Explain how pole-zero location will affect the frequency response of an LTI system.
10. State and prove initial value theorem of z-transform.
11. Find the z-transform of

$$x(n) = \left(\frac{1}{2}\right)^{|n|}$$

(4 × 5 = 20 marks)

Part C

12. (a) (1) Plot (i) $x(2t - 3)$; (ii) $x(1.5t - 0.5)$ and (iii) $x(2 - 0.5t)$.

if

$$x(t) = 1, 0 \leq t \leq 1$$

$$= e^{-t}, t \geq 1$$

$$= 0, \text{ otherwise.}$$

(6 marks)

Turn over

(2) Explain the following with an example :

(i) Causality ; (ii) invariance.

Or

(a) Find the convolution of

$$x(t) = u(t+1) - u(t-1)$$

with

$$h(t) = u(t+2) - u(t-2).$$

13. (a) (1) Show that the Fourier transform of a conjugate symmetric signal is purely real.

(6 marks)

(2) State and prove Parseval's theorem for Fourier transform.

(4 marks)

Or

(b) (1) State and prove any two properties of Hilbert transform.

(5 marks)

(2) Find the Fourier transform of

$$\begin{aligned} x(t) &= 1, 0 \leq t \leq 1 \\ &= -1, -1 \leq t \leq 0 \\ &= 0, \text{ otherwise.} \end{aligned}$$

(5 marks)

14. (a) Find the impulse response of the system described by the differential equation :

$$\frac{d^2 y(t)}{dt^2} + 6 \frac{dy(t)}{dt} + 5y(t) = x(t)$$

using Laplace transform.

Or

(b) (i) State and prove any two properties of discrete Fourier series.

(5 marks)

(ii) Find the discrete-time Fourier transform of

$$\begin{aligned} x(n) &= \left(\frac{1}{2}\right)^n, n \geq 0 \\ &= 3^n, n < 0. \end{aligned}$$

(5 marks)

15. (a) Find the inverse z-transform of

$$X(z) = \frac{z}{3z^2 - 4z + 1}$$

for all possible ROCs.

Or

(b) A causal discrete-time LSI system is described by

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$$

(1) Determine the system function.

(2) Find the step response of the system.

(3 + 7 = 10 marks)

[4 × 10 = 40 marks]