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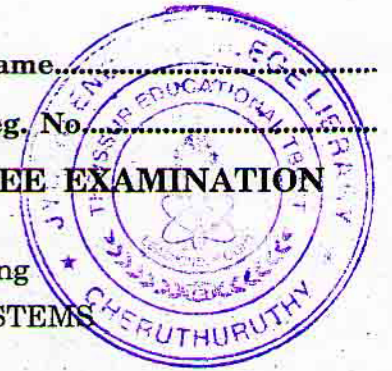
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Name: .....

Reg. No. ....

**THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION  
OCTOBER 2012**

Electronics and Communication Engineering  
EC 09 304/ PTEC 09 303—SIGNALS AND SYSTEMS  
(2009 Admissions)



Time : Three Hours

Maximum : 70 Marks

**Part A**

*Answer all questions.*

1. Is the system  $y(n) = 0.11x(n-1) + x(n) - 0.8x(n+1)$  is causal.
2. Define Power spectral density.
3. Find the Laplace transform of  $f(t) = t^3 + 3t^2 - 6t + 4$ .
4. How is  $z$  transform obtained from Laplace transform ?
5. What is ROC ?

(5 × 2 = 10 marks)

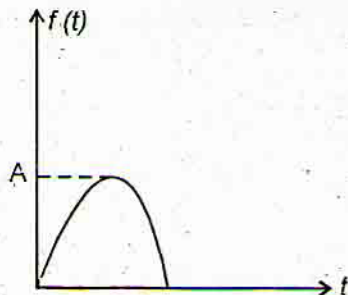
**Part B**

*Answer any four questions.*

6. Show that the system described by the differential equation is non linear :

$$\frac{dy(t)}{dt} + 10y(t) + 5 = x(t).$$

7. Determine the signal energy and signal power for  $f(t) = e^{-3|t|}$ .
8. Find the Laplace transform of the waveform shown below :



Turn over

9. Find the  $z$  transform of  $\cos \omega_0 n$  for  $n \geq 0$ .
10. Find the magnitude and phase response for the system  $y(n) = \frac{1}{6}x(n) + \frac{1}{3}x(n-1) + \frac{1}{6}x(n-2)$ .
11. Test the system  $y(n) = n^2 x(n)$  for time invariance.

(4 × 5 = 20 marks)

**Part C**

12. (a) With suitable examples explain the different classification of signals.

*Or*

- (b) Test the stability of the system whose impulse response  $h(n) = \left(\frac{1}{2}\right)^n n(n)$ . (3 marks)

- (c) Find the convolution of sequences given  $x(n) = \{3, 2, 1, 2\}$ ,  $h(n) = \{1, 2, 1, 2\}$  (7 marks)

13. (a) (i) Calculate the frequency response for the LTI system

$$h(n) = (0.9)^n \left( e^{j\pi/2} \right)^n n(n). \text{ (6 marks)}$$

- (ii) Find the Fourier transform of  $x(n) = (0.8)^{|n|}$  for all  $n$ . (4 marks)

*Or*

- (b) (i) Determine the output response of the low pass RC network due to an input  $x(t) = t e^{-t/RC}$  by convolution. (8 marks)

- (ii) Define Fourier transform pair. (2 marks)

14. (a) Explain the properties of Laplace transform with suitable examples.

*Or*

- (b) (i) Find the two sided Laplace transform of

$$f(t) = \begin{cases} e^{-3t} & \text{for } t > 0 \\ 0 & \text{for } t < 0 \end{cases}$$

What is the region of convergence ?

(7 marks)

(ii) Find the inverse Laplace transform  $f(t) = \frac{s-1}{(s+1)(s^2+2s+5)}$ . (3 marks)

14. (a) Find the impulse response, frequency response, magnitude response and phase response of the second order system  $y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) + \frac{1}{2}x(n-1)$ .

(10 marks)

Or

(b) (i) Determine the  $z$  transform of  $x(n) = -a^n n(-n-1)$ . Sketch the ROC. (5 marks)

(ii) Determine the step response of an LTI system whose impulse response  $h(n) = a^{-n} n(-n)$ ,  $0 < a < 1$ .

(5 marks)

(4 × 10 = 40 marks)