

- c) Explain uncorrelated and orthogonal random variables.
- d) Discuss about the auto covariance and autocorrelation matrices.

OR

Discuss about the transmission of random signals through a LTI system.

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Total No. of Questions :5]

[Total No. of Printed Pages :4

**EI - 402****B.E. IV Semester**

Examination, December 2015

**Signals and Systems****Time : Three Hours****Maximum Marks : 70**

- Note:** i) Attempt any five questions. In each question part A, B, C is compulsory and D part has internal choice.
- ii) All parts of each questions are to be attempted at one place.
  - iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
  - iv) Except numericals, Derivation, Design and Drawing etc.

**Unit - I**

1. a) Classify the types of signals.
- b) Differentiate between discrete and digital signal.
- c) State and explain sampling theorem.
- d) Examine the following system and show that they are causal LTI or not.
  - i)  $y(n) = x(-n + 2)$
  - ii)  $y(n) = \sum_{k=-\infty}^{n+1} x(k)$
  - iii)  $y(n) = x(2n)$

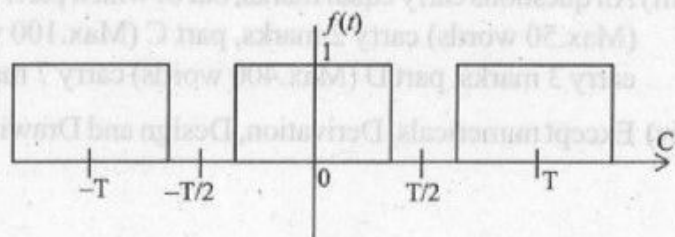
OR

Determine the impulse response of the system described by the second order difference equation

$$y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$$

**Unit - II**

- State and prove the time shifting property of continuous time Fourier transform.
- State and prove the frequency shifting property of continuous time Fourier transform.
- State and prove convolution property of continuous time Fourier transform.
- Determine the Fourier series of the signal shown in fig.



OR

A LTI system is described by the following difference equation

$$y(n) = a y(n-1) + b x(n) \quad 0 < a < 1$$

Determine the magnitude and phase of the frequency response  $H(\omega)$  of the system.

**Unit - III**

- Determine the spectra of the signals  $x(n) = \cos \sqrt{2} \pi n$ .
- State the properties of discrete Fourier transform.

- Determine the spectra of the signal  $x(n) = \{1, 1, 0, 0\}$  where  $x(n)$  is periodic with period  $N = 4$ .
- Discuss about the symmetry property of DFT.

OR

Discuss about the multiplication of two DFT's and circular convolution.

**Unit - IV**

- Determine the two transform of  $x(n) = S(n+k)$ ,  $k > 0$ .
  - Determine the two transform of  $x(n) = \left(\frac{1}{2}\right)^n u(n)$ .
  - State and prove time differentiation property of two transform.
  - Determine the signal  $x(n)$  whose Z-transform is given by  $X(z) = \log(1 + az^{-1})$ ,  $|z| > |a|$

OR

Determine the causal signal  $x(n)$  whose Z-transform is given by:

$$x(z) = \frac{1 + z^{-1}}{1 - z^{-1} + 0.5z^{-2}}$$

**Unit - V**

- What are random variables?
  - What is ensemble averages?