

[4]

- 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.

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) $y(n) = x(2n)$

[2]

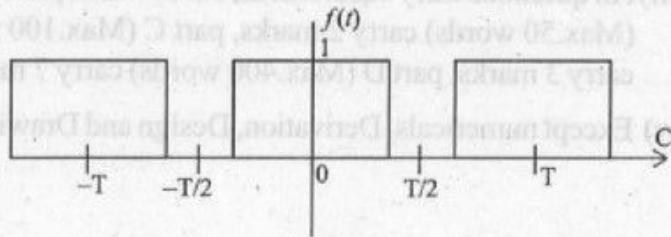
OR

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.

[3]

- 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 $X(z) = \log(1 + az^{-1}) \quad |z| > |a|$

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?