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S.E. (Electronics & TC / Electronics & Comm Engg) Semester- IV
(Revised Course 2007-08) EXAMINATION Nov/Dec 2019
Signals & Systems

[Duration : Three Hours]

[Total Marks : 100]

Instructions:

1. Assume suitable data wherever necessary
2. Answer five full questions taking at least one from each module

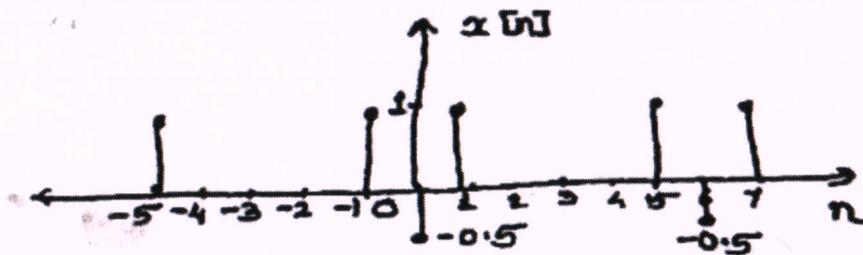
Module- I

- Q.1
- a) Write a MATLAB code to generate and plot the following signal $x[n] = \sin(0.5\pi n) + 0.4$; $0 \leq n \leq 25$ 4
 - b) Answer the following. 8
 - i) Check the causality property of system $y(t) = \sin(6t)x(t-2)$
 - ii) Check for memory less property of the system, $y[n] = x[n]x[n-5]$
 - iii) $y[n] = x[n]x[n-2]$, check if system is invertible
 - iv) $y(t) = x[t]u(t)$, check time invariance property.
 - c) Find out discrete time convolution of following signals. 8
 $x[n] = 1$; $-1 \leq n \leq 1$ $h[n] = 1$; $-1 \leq n \leq 1$

- Q.2
- a) Obtain the convolution of the following signals. 8
 $x(t) = e^{-2t}\{u(t) - u(t-2)\}$ $h(t) = e^{-t}u(t)$
 - b) Determine the stability of the system whose impulse response is given as 6
 - i) $h[n] = \left(\frac{1}{7}\right)^n u[n+4] + \left(\frac{1}{2}\right)^n u[-n+1]$
 - ii) $h[n] = 2^{n+1}u[-n]$
 - c) Sketch the signals 6
 - i) $x(t) = \text{odd}\{\cos(t)u(t)\}$
 - ii) $u(6-t)$

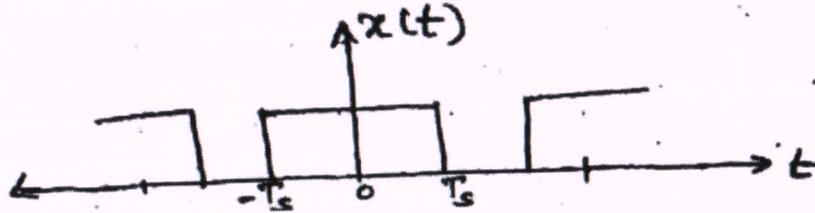
Module- II

- Q.3
- a) State the conditions of convergence of Fourier series for continuous time periodic signals. Explain Gibbs phenomena. 6
 - b) Given the discrete time periodic signal, find out DTFS coefficients. 6

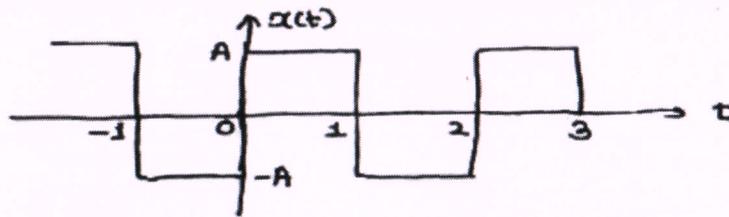


- c) Explain time shifting property of DTFS. 4

- d) Explain multiplication property of DTFS. 4
- Q.4 a) Determine the Fourier series representation of the square wave and draw $|x(k)|$ and $\angle x(k)$ 7



- b) Find Fourier series coefficients of the signal as shown below. 8



- c) State Dirichlet's conditions for convergence of CTFS 5

Module 3

- Q.5 a) Consider an analog signal $x(t) = 7 \cos 300 \pi t$. 6
 i) Determine the minimum sampling rate to avoid aliasing.
 ii) If sampling rate $F_s = 400$ Hz. What is the DT signal after sampling? 8
- b) Explain Linearity, differentiation and integration properties of CTFT. 6
- c) Find the DTFT of the following signals:
 (i) $x(n) = a^n; a < 1$ ii) $x(n) = 2^n u(n)$

- Q.6 a) Consider the analog signal $x(t) = 3 \cos 50\pi t + 10 \sin 300\pi t - \cos 100\pi t$. What is the Nyquist rate for the signal? 4
- b) Explain convergence of Fourier transform along with Dirichlet condition 6
- c) Explain Convolution and multiplication property of CTFT 10

- Q.7 a) Obtain the inverse Laplace transform of the function $X(s) = \frac{1}{s^2 + 3s + 2}$, ROC: $-2 < \text{Re}\{s\} < -1$ 7
- b) What is region of convergence (ROC)? Mention its properties in Laplace transform 5
- c) Find Z-transform of following signal (i) $x[n] = 7 \left(\frac{1}{3}\right)^n u[n] - 6 \left(\frac{1}{2}\right)^n u[n]$ (ii) $x[n] = a^n u[n]$ 8

- Q.8 a) Find the inverse Z-transform using partial fraction method 6

$$X(Z) = \frac{Z}{(Z - 1)^3}$$

b) Find Laplace transform $Y(s)$ of the following signals

(i) $y_1(t) = tx(t)$ (ii) $y_2(t) = e^{-t}x(t)$

6

c) Explain the significance and properties of ROC for Laplace transform

4

d) Find the Z-transform of the following sequence

4

$x[n] = \{1, 2, -1, 2, 3\}$