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5E5021

Roll No. Total No of Pages: 4

5E5021

B. Tech V Sem. (Main/Back) Exam. Nov-Dec. 2015
Electronics & Communication Engineering
5EC1A Signal & Systems
Common with EI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks Main: 26

Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 For the system described by the following equations, with the input x(t) and output y(t), determine which of the systems are linear and which are nonlinear.

(a) $\frac{dy(t)}{dt}+3y(t)=x(t)$ [4]

(b) $\frac{dy(t)}{dt}+2y(t)=x^2(t)$ [4]

(c) $\frac{d^2y(t)}{dt^2}+2y(t)=x(t)$ [4]

(d) $\frac{dy(t)}{dt}+3y(t)+4=x(t)$ [4]

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OR

Q.1 Show that:-

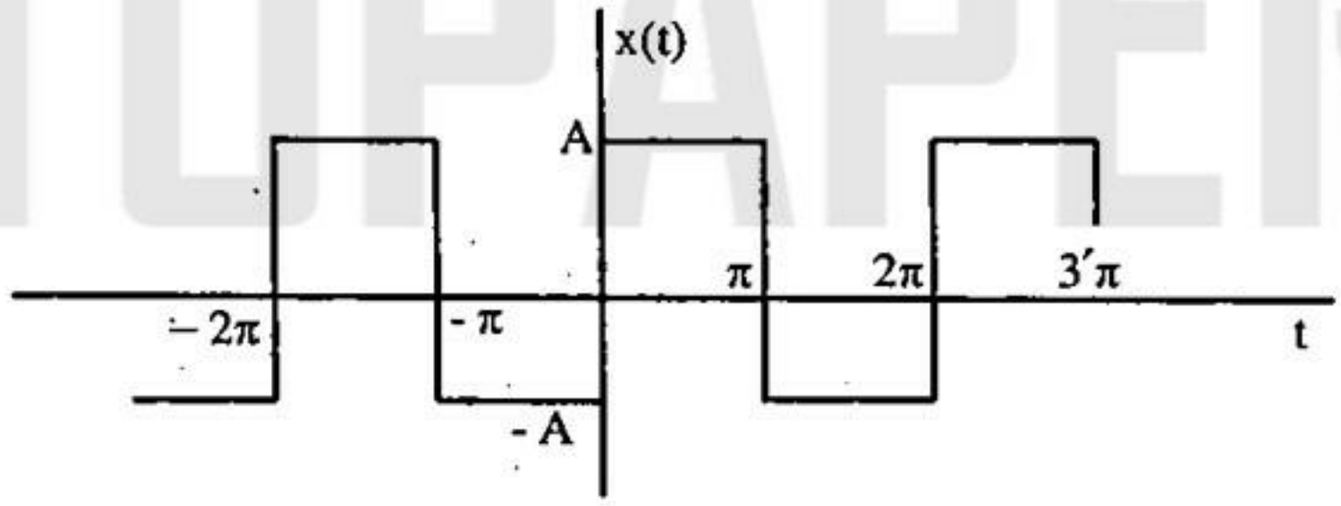
(a) the convolution of an odd and an even function is an odd function. [6]

(b) the convolution of two odd functions is an even function. [5]

(c) the convolution of two even functions is an even function. [5]

UNIT-II

Q.2 (a) Find the trigonometric Fourier series for the square wave shown in fig. and plot the line spectrum. [8]



(b) Describe the properties of continuous time Fourier series. [8]

OR

Q.2 (a) Determine the Fourier series coefficients of the signal x(n) and plot its magnitude and phase spectrum. [8]

$$x(n)=1+\sin\left(\frac{2\pi}{N}n\right)+3\cos\left(\frac{2\pi}{N}n\right)+\cos\left(\frac{4\pi}{N}n+\frac{\pi}{2}\right)$$

(b) Determine the DTFS coefficients of the signal x(n), [8]

$$x(n)=2+2\cos\frac{\pi}{4}n+\cos\frac{\pi}{2}n+\frac{1}{2}\cos\frac{3\pi}{4}n$$

UNIT-III

Q.3 (a) Find the Fourier Transform of the unit step function [8]

$$x(t)=\begin{cases}1, & t\geq 0\\ 0, & t<0\end{cases}$$

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(b) Find the inverse Fourier Transform of [8]

$$x(jw)=\begin{cases}2\cos w & , \ |w|\le \pi \\ 0 & , \ |w|>\pi\end{cases}$$

OR

Q.3 (a) Describe the properties of DTFT. [8]

(b) Find the DTFT of the signal $x[n]=\{2, 1, \underset{\uparrow}{4}, 1, 2\}$ [8]

UNIT-IV

Q.4 (a) Determine the z – transform of [8]

$$x[n] = -u[-n-1]+\left(\frac{1}{4}\right)^n u(n).$$

Depict the poles, zeros and ROC on the z-plane.

(b) Find the z-transform and the ROC of the discrete sinusoid signal [8]

$$x[n] = [\sin(\Omega n)]u(n)$$

OR

Q.4 (a) Write down the properties of Laplace Transform. [8]

(b) Find the inverse Laplace transform of [8]

$$X(s)=\frac{9s+10}{s(s+2)}$$

UNIT-V

Q.5 (a) Describe the sampling theorem. [8]

(b) The signals [8]

$$x_1(t) = 10\ \mathrm{Cos}(100\,\pi\, t) \text{ and } x_2(t) = 10\ \mathrm{Cos}(50\,\pi\, t)$$

are both sampled with fs = 75 H_2. Show that the two sequences of samples so obtained are identical.

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OR

Q.5 (a) A Continuous-time signal consisting of frequency 500 Hz and its third harmonic is sampled at the Nyquist rate of sampling. Find the corresponding discrete time signal [8]

(b) Let $x(n) = \{1, \underset{\uparrow}{2}, 5, -1\}$. Generate - [8]

(i) decimated signal x(2n).

(ii) various interpolated version (zero interpolation and step interpolation) of x(n/3).

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