

<b>5E5021</b>	Roll No.	<b>5E5021</b>	Total No of Pages: <span style="border: 1px solid black; padding: 2px;">4</span>
<p><b>B. Tech V Sem. (Main/Back) Exam. Nov-Dec. 2015</b>  <b>Electronics &amp; Communication Engineering</b>  <b>5EC1A Signal &amp; Systems</b>  <b>Common with EI</b></p>			

**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]

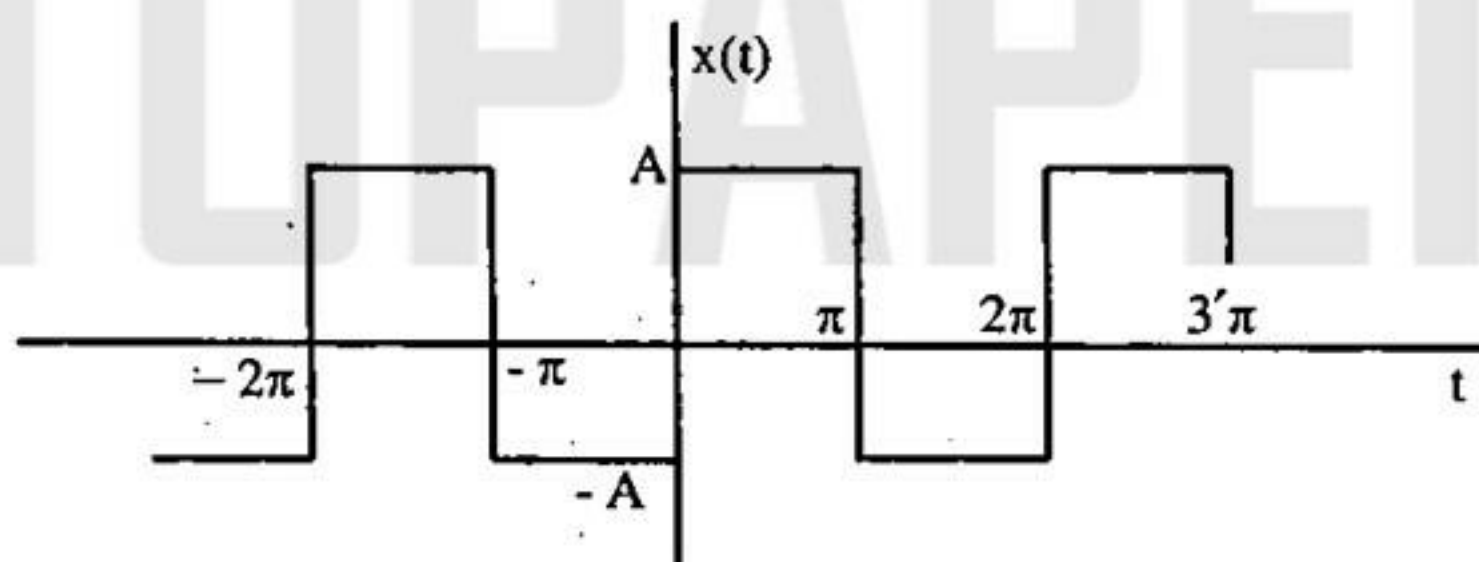
OR

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]

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

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

$$x(j\omega) = \begin{cases} 2\cos\omega & , \quad |\omega| \leq \pi \\ 0 & , \quad |\omega| > \pi \end{cases}$$

OR

- Q.3 (a) Describe the properties of DTFT. [8]  
 (b) Find the DTFT of the signal  $x[n] = \{2, 1, 4, 1, 2\}$  [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]

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

are both sampled with  $f_s = 75 \text{ Hz}$ . Show that the two sequences of samples so obtained are identical.

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

(i) decimated signal  $x(2n)$ .

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