

**Department Of Electronics and Communication Engineering**  
**National Institute Of Technology, Srinagar**  
**Major Examination, Regular - Autumn 2019**

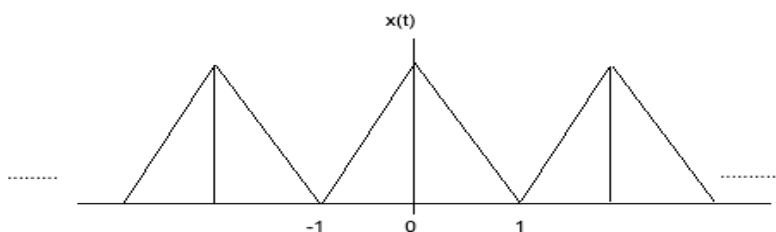
**Course: B.Tech – CSE**  
**Subject: Signal and Systems – ECE 305**  
**Max Marks: 90**

**Semester: III**  
**Duration: 3 Hours**  
**Dated: 09-03-2020**

**Note: Attempt any five questions. Draw diagrams wherever necessary.**

**Q1: CO1, CO2**

- a) For the following signal, find the exponential Fourier series



[9]

- b) Determine which of the following signals are energy signals, power signals or NENP using a systematic approach:

$x_1(t) = \cos(t)$

$x_2(t) = \left(\frac{1}{3}\right)^n u(n)$

[9]

**Q2: CO3, CO1, CO2**

- a) Using the convolution theorem of Laplace Transform find  $y(t) = x_1(t) \times x_2(t)$

Where  $x_1(t) = e^{-3t}u(t)$  and  $x_2(t) = u(t - 2)$

[6]

- b) Sketch the following signals:

i.  $r(t) - 2r(t-1) + r(t-2)$

ii.  $\prod(t - 1/2)$

iii.  $r(-0.5t + 2)$

[6]

- c) State and prove the following properties of Fourier transform:

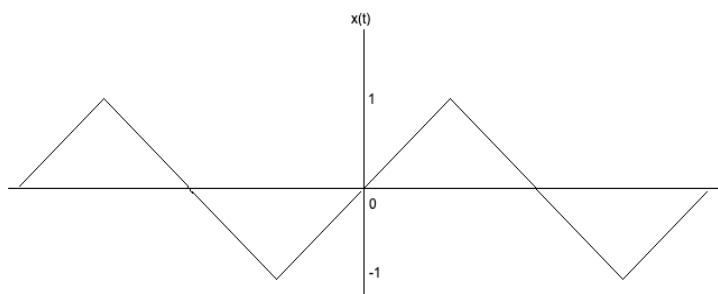
i. Linearity

ii. Time shifting

[6]

**Q3: CO3, CO1**

- a) Find the trigonometric Fourier series for the periodic signal  $x(t)$ :



- b) Using the classical approach find the natural response of the system described by the difference equation:

$$y(n) - 1.5y(n-1) + 0.5y(n-2) = x(n)$$

$$y(-1) = 1; y(-2) = 0$$

[9,9]

**Q4: CO1**

- a) Find the convolution of the following signals  
 $h(t) = e^{-t} u(t)$  ;  $x(t) = e^{-3t} \{u(t) - u(t - 2)\}$
- b) Find the Fourier transform of the signum function and plot its magnitude spectrum

[9,9]

**Q5: CO3**

- a) Find the Laplace transform of the given signals and indicate the ROC.

i.  $x(t) = -e^{-at}u(t)$

[6]

ii.  $y(t) = e^{-at}u(t) + e^{-bt}u(-t)$

[6]

- b) Find the signal whose bilateral transform is

$$X(s) = 1/(s + 5)(s + 1)$$

With  $-5 < \text{Re}(s) < -1$

[6]

**Q6: CO4, CO1**

- a) Let X be a continuous random variable with the following PDF

$$f_X(x) = \begin{cases} ce^{-x} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Where c is a positive constant

Find c, CDF of X,  $F_X(x)$

Find  $P(1 < X < 3)$

[9]

- b) Check whether the following systems are static or dynamic, linear or non-linear, causal or non-causal, time invariant or time-variant

i.  $\frac{y(t)d^2y(t)}{dt^2} + \frac{3tdy(t)}{dt} + y(t) = x(t)$

ii.  $y(t) = \text{odd}\{x(t)\}$

iii.  $y(n) = \cos\{x(n)\}$

[9]