TE sem V / CTSS ETRX 2/6/2014

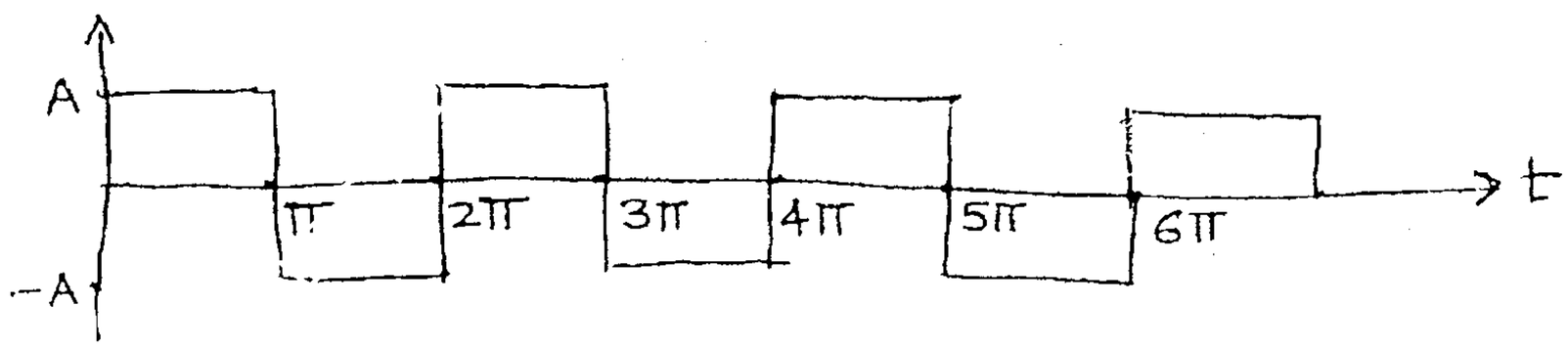
QP Code : **MV-18523**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Questions No. **1** is **compulsory.**
(2) **Solve** any **four** out of remaining **six.**
(3) **Assume** suitable **data** wherever **necessary.**

1. Solve any **four** :– **20**
   (a) Define ESD and PSD. What is the relation of ESD and PSD with autocorrelation ?
   (b) State the conditions which are required to be satisfied by function f(t) for Fourier series to exist.
   (c) Find whether following signal is energy or power signal :–
   $$x(t) = A\, e^{-at}\, u(t),\ a > 0$$
   (d) Explain the relationship between Fourier Transform and Laplace Transform of the signal.
   (e) State initial and final value theorem in Laplace Transform. Also find initial and final value if :– $x(s) = \dfrac{s+10}{s^2+2s+2}$

2. (a) A LTI system is given by :–
   $$\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y(t) = 2x(t) \text{ with } y(0) = 2,\ y^1(0) = 4 \text{ and } x(t) = u(t)$$
   Find :–
   (i) Zero Input Response **4**
   (ii) Zero State Response **4**
   (iii) Total Response. **2**
   (b) Find the trigonometric Fourier series of the following function :– **10**



3. (a) Convolute the following signal :– **10**
   $$x(t) = e^{-t}u(t);\ \ h(t) = e^{-2t}u(t)$$
   (b) What are random functions ? Explain moments of random functions with suitable example. **10**

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4. (a) $x(s) = \frac{2s^2 + 5s + 5}{(s+2)(s+1)^2}$ Find x(t) for all possible ROC. **10**

(b) Classify the system based on Linearity, Time variance, Causality, Stability, Static/Dynamic :– **10**

(i) $y(t) = \sin t \; x(t)$, Sin(t)·X(t)

(ii) $y(t) = e^{x(t)}$

5. (a) What is the PDF of Uniform, Exponential and Gaussian Distribution ? **10**

(b) Find the Fourier transform of ~~signal~~ function :– **10**

Signum

6. (a) Obtain state variable model of continuous time LTI system described by differential equation :– **10**

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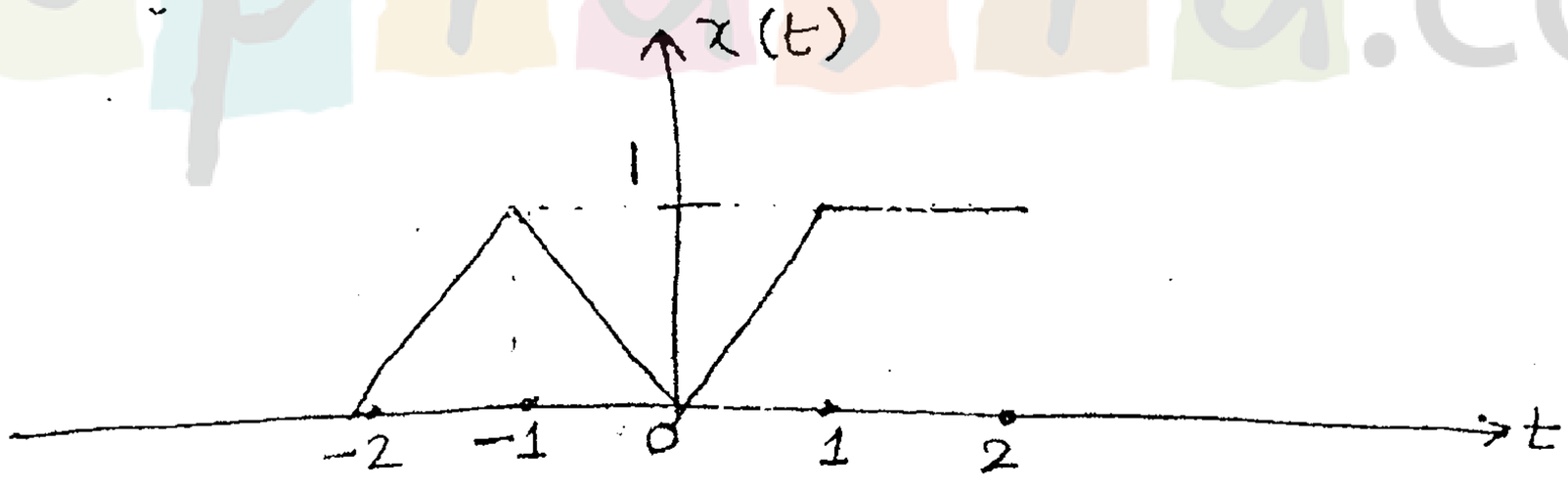
$$2\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 6y(t) = 2x(t)$$

(b) Determine even and odd components of the signal :– **10**



7. Write short notes on any **four** :– **20**

(a) BIBO Stability and ROC

(b) Properties of Fourier Transform

(c) Gibb's phenomenon

(d) Random processes

(e) Rayleigh's energy theorem.
