Q. P. Code : 722301

(3 hours) Total Marks: 80

N.B.: (1) Question No. 1 is compulsory.
(2) Solve any three questions from remaining five questions.
(3) Draw neat diagrams and assume suitable data wherever necessary. Justify your assumptions.

Q-1) a) Classify whether the given system: 20

$y(n) = x(n-1) + x(n)$ is

i) Static/Dynamic
ii) Linear/Non Linear
iii) Time Variant/Time Invariant and
iv) Causal / Non Causal

b) Determine whether the given signals are periodic or non- periodic. If it is periodic find its fundamental period.
i) $x(t) = 2\cos 100\pi t + 5 \sin 50t$
ii) $x(n) = \sin(6 \frac{\pi}{7} n + 1)$

c) State different properties of ROC of Z transform

d) Sketch the even and odd components of the given signal.

$$x(t) = \begin{cases} t ; & 0 \le t \le 1 \\ 2-t ; & 1 \le t \le 2 \end{cases}$$

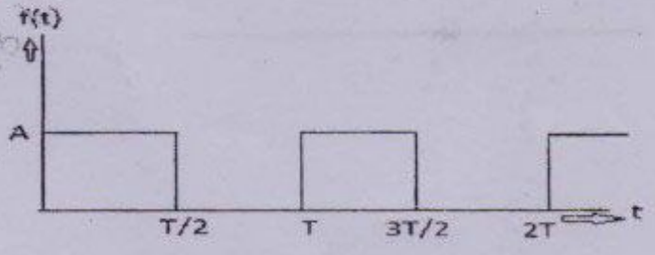
Q-2) a) Define and explain 10

i) Auto Correlation
ii) Cross Correlation
iii) Linear Convolution
iv) Circular Convolution

b) Find the inverse Laplace transform of the following function: 10

$$X(s) = \frac{s^2 + s - 3}{s^2 + 3s + 2}$$

Q-3) a) Find the trigonometric Fourier series for the wave shown 10



b) Determine whether the given signals are energy signal or power signal and calculate it accordingly. 10

i) $x(t) = 4 \sin(6\pi t + \pi/6)$

ii) $x(t) = A \cos 100\pi t$

Q-4) a) Given two systems are connected in cascade 10

$h_1(n) = a^n\ u(n)\ ;\ a<1$

& $h^2(n) = b^n\ u(n)\ ;\ b<1$

Find the overall impulse response of the system using convolution.

b) Obtain inverse z- transform of the following X (z) 10

$$X(Z) = \frac{1}{(1+z^{-1})\ (1-z^{-1})}\ ;\ ROC\ |z| > 1$$

Q-5) a) Determine the Z transform of the given signals and also sketch the ROC 10

i) $x_1[n] = [1/3]^n\ ;\ n \geq 0$

ii) $x_2[n] = x_1[n+4]$

b) LTI system is described by the differential equation 10

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

Using Fourier transform calculate y (t) if $x(t) = e^{-3t}\ u(t)$ is applied to the system.

Q-6) a) A stable system has the input x (t) and output y (t). Use Laplace transform to determine the transfer and impulse response of the system given: 10

$x(t) = e^{-2t}\ u(t)$

$y(t) = -2e^{-t}\ u(t) + 3e^{-3t}\ u(t)$

b) Determine the system function, Unit sample response and pole zero plot of the system described by the difference equation: 10

$$y(n) - 1/2\ y(n-1) = 2x(n)$$