Time: 3 Hours **Max. Marks: 80**

Note: -1. Question no. 1 is compulsory.
2. Answer any three out of remaining questions.
3. Figures to right indicate full marks.
4. Assume suitable data wherever necessary.

Q.1 a) state whether the signal x(n) is energy or power signal, $x(n)= (0.5)^n u(n)$ [5]

b) A discrete time signal is given x(n) [5]

$x(n)= \{1, 1, \underset{\uparrow}{1}, 1, 2\}$

sketch i) x(n-2), ii)x(n+1) iii)x(3-n) iv) x(n) u(n-1)

c) Find the Laplace Transform of $x(t)= 5 e^{4t}+6t^3- 3\sin5t+2\cos2t$ [5]

d) Determine Z transform & ROC of signal $x(n)=[3(4)^n-5(3)^n] u(n)$ [5]

Q.2 a) Determine whether the system described by Y(t) = x(0.5t) is [10]
i) Linear ii)Memoryless iii)Causal iv)Time invariant v)stable

b) Perform the convolution [10]

i) x(t) = t. u(t) $h(t) = e^{-t}$ for $t\geq 0$

ii) x(t)= u(t-1) h(t) = u(t-2)

Q3 a) Given the Laplace Transform of $x(s) = \frac{2s}{s^2+2}$ where x(t)=0 for t≤0 [10]
Determine the Laplace Transform of the following using properties
i)x(3t) ii) convolution $x(t)* \frac{dx(t)}{dt}$ iii) x(t-2) iv) $e^{-t}x(t)$ v) 2t x(t)

b) Obtain inverse Laplace Transform of $x(s) = \frac{3S+7}{s^2-2S-3}$
For ROC Re(s)>3, Re(s)<-1, -1<Re(s)<3 [10]

Q 4 a) i) State and prove Time scaling property of Z transform [5]
ii) Obtain Z transform of signal $x(n) = n a^n u(n)$ [5]

b) Obtain Transfer function, Find Impulse response, ROC & stability for given system
$Y(n)= - 0.5y(n-1)+ x(n)$ where $x(n) = 3^n u(n)$ [10]

Q5 a) Determine the spectra of periodic signal x(n) = {1,1,1,0} with period N=4 using discrete Time Fourier series [10]

b) Obtain the Fourier Transform& sketch amplitude spectrum of rectangular pulse of duration T & amplitude A [10]

rect(t/T)= A for –T/2 to T/2

= 0 elsewhere

Q6 a) Find Fourier transform of (10)

i) Delta function ii) Signum function.

b) Explain necessary conditions for the existing of Fou rier series. (5)

c) Define ROC for Laplace transform and state all the properties of L. T. (5)

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