CS/B.Tech/(ECE-New)/SEM-3/EC-303/2013-2014

2013

SIGNAL & SYSTEM

Time Allotted : 3 Hours | Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Question)

1. Choose the correct alternatives for any *ten* of the following: 10 x 1 = 10

i) Laplace Transform of e^{-at} is

a) $\frac{1}{(s+a)}$ b) $\frac{1}{(s-a)}$

b) $\frac{a}{(s-a)}$ d) $\frac{a}{(s-a)}$

ii) x(t)=asinωt is an

a)odd signal b)even signal

c)both (a) and (b) d)either (a) or (b).

iii)The signal x(n)= 1+ $e^{j4\pi n/7}$ - $e^{j2\pi n/5}$ is periodic with period of

a) $\frac{5}{7}$ b) $\frac{7}{5}$

c) $\frac{4}{7}$ d) $\frac{4}{5}$

iv) The system define as y(n)=2x(n)+3x(n^2) is

a)static , causal b)dynamic ,causal

c)static ,non-causal d)dynamic ,non-causal

v) ROC of unit step function is

a) $|z|<1$ b) $|z|>1$

c) $|z|=1$ d)none of these

vi) The discrete time system defined as

$$H(z)=\frac{z^3-3z^2+2z}{z^2+\frac{1}{2}z-\frac{1}{4}}$$ is

a)causal

b) non-causal

c)none of these

vii) Which one of the following rules determines the mapping of s-plane to z-plane

a) Right half of s-plane maps into outside of unit circle in z-plane.

b) Left half of s-plane maps into inside of unit circle in z-plane.

c) Imaginary axis of s-plane maps into circumference of unit circle in z-plane

d) All of these

viii) Energy of power signal is

a)finite b)zero

c)infinite d) between 1 and 2

ix) A system with input x(n) & output y(n) is given as

y(n)=sin(5/6πn)x(n). The system is

a) Linear ,stable & invariant
b) Non-linear ,stable & variant
c) Linear ,stable & variant
d) Linear ,unstable & invariant

x) The fourier transform of a conjugate symmetric function is

a) imaginary

b) real

c) conjugate asymmetric

d) conjugate symmetric

xi) Energy density function is always

a)even

b)odd

c)neither even nor odd

d)both (a) &(b)

xii) A discrete time system is stable if and only if the ROC of H(z)

a)excludes $|z|=1$ b)includes $|z|=1$

c) both (a) &(b) d)none of these

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 x 5 = 15

2. What is meant by aliasing ? What is an anti-aliasing filter?

2+3

3. Explain the properties of X(z).

4. What is time-invariant system? Determine whether the following

Signal is time- invariant or not : 2+3

Y(t)=x(-t)

5. State and prove initial value theorem of Z- transform

6. Determine the energy and power of the following signals:

a) x(t)=t u(t) b) x2n)=$3e^{j3\pi n}$ 3+2

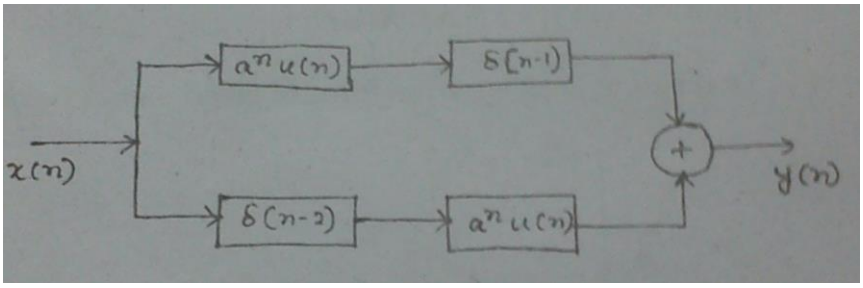
GROUP – C

(Long Answer Type Questions)

Answer any three of the following. 3 x 15 = 45

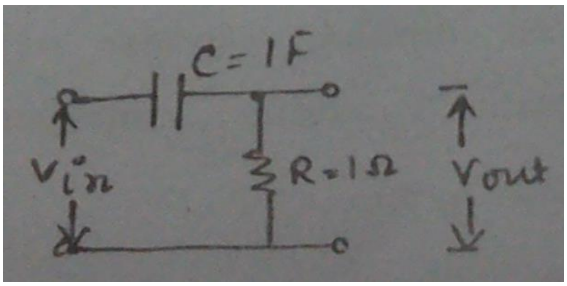
7. a) LTI system can be completely characterized by its impulse response. Explain.

b) Find the overall impulse response of the system shown in fig:



b) Using Z-transform find the convolution of two sequence
X1(n)={1,2,-1,0,3}; x2(n)={1,2,-1} 5+5+5

8. a) Find out the output of the system shown in figure given below for the input e^{-2t} u(t) using laplace transform:



c) Sketch the convolution of following two signals:

$$x(t)=\begin{cases} t+1, & 0\le t\le 1 \\ 2-t, & 1\le t\le 2 \\ 0, & \text{elsewhere} \end{cases}$$

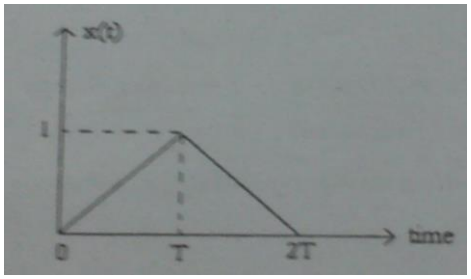
and $h(t)=\delta(t+2)+2\delta(t+1)$.

7+8

9. a) Define s-plane . Describe the concept of poles and zeros in complex plane.

b) If X(s) is the Laplace transform of x(t) , then show that L[x(at)]=1/|a|X(s/a).

c)Determine Laplace transform of a given signal below:



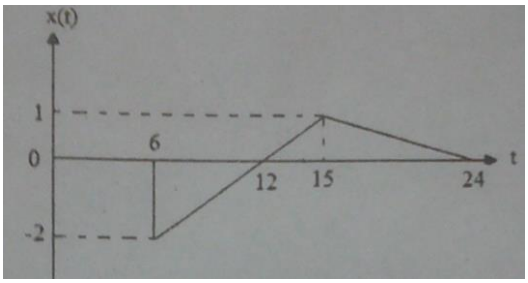
5+4+6

10. a) Sketch the given signal x(t)=A[u(t+a)-u(t-a)] for a>0. Also determine The given signal is a power signal or an energy signal or neither.

b) From the given impulse response h(n)=$5^n u(3-n)$, check the causality & stability of the system.

c) What is half – wave symmetry?

d)The signal x(t) is shown below:



6+4+1+4

Sketch signal x(3t).

11. a) What is Z-transform ? Find inverse Z-transform of the following:

$$X(z) = \frac{(Z+0.5)}{(Z+0.6)(Z+0.8)}$$ (using Residue method).

b) State the properties of ROC. (2+10)+3

12. Write short notes on any three of the following : 3*5

a) Dirichlet's condition for Fourier series

b)Time scaling of a signal

c)Causal system & non-causal system

d)Conditional probability

e)Scalar signal & vector signal.