ROLL NO. _____

**Code: AE06/AC04/AT04 Subject: SIGNALS & SYSTEMS**

# AMIETE – ET/CS/IT (OLD SCHEME)

**Time: 3 Hours** **JUNE 2012** **Max. Marks: 100**

***PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.***

**NOTE: There are 9 Questions in all.**

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

**Q.1 Choose the correct or the best alternative in the following:** **(2×10)**

a. A system y(n) = x(- n) is

**(A)** Causal **(B)** Non Causal
**(C)** Both **(D)** None

b. Step function u(t) is obtained from impulse function δ(t) by

**(A)** Integrating **(B)** Differentiating
**(C)** Double Integration **(D)** Differentiating twice

c. A system y(t) = t x(t) is

**(A)** Non linear **(B)** Unstable
**(C)** Linear **(D)** Both **(A)** and **(B)**

d. A signal that violates the first Dirichlet condition i.e. x(t) must be absolutely integrable is

**(A)** $t^2$ **(B)** t
**(C)** $t^3$ **(D)** 1/ t

e. The frequency response of discrete time filters must be periodic with period

**(A)** 2π **(B)** π
**(C)** π/2 **(D)** 3π/2

f. The FT of a periodic impulse train in time domain with period T is a periodic impulse train in frequency domain with period

**(A)** 4π/ T **(B)** π/ T
**(C)** 3π/ T **(D)** 2π/ T

g. The Frequency response of an LTI system with impulse response $h(t) = e^{-t} u(t)$ is

**(A)** 1/ (jω+ 1) **(B)** 1/ (jω – 1)
**(C)** 1/ (1-jω) **(D)** $1/(e^{j\omega}+ 1)$

h. FT is used to convert from Time domain to frequency domain, the signals which are

**(A)** Periodic **(B)** Aperiodic
**(C)** Both **(D)** None

i. Step response of a first order system

**(A)** Always exhibits Ringing Effect
**(B)** Does not exhibit Ringing Effect
**(C)** Sometimes exhibits Ringing Effect
**(D)** Sometimes does not exhibit Ringing Effect

j. For a signal which is bandlimited to a frequency of 100 Hz, the Nyquist Rate will be

**(A)** 100 Hz **(B)** 200 Hz
**(C)** 50 Hz **(D)** 150 Hz

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**Answer any FIVE Questions out of EIGHT Questions.**
**Each question carries 16 marks.**

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**Q.2** a. (i) Show that any real signal x(t) is composed of its even and odd parts. **(4)**
(ii) Find out the energy of the signal $x(t) = e^{-3t}\ u(t)$. **(4)**

b. Give the five classification of systems with an example of each. **(8)**

**Q.3** a. Find out the linear convolution of x(n) = { 1, 2, 3,-6} with h(n) = {2, 1, -1, 3,5} **(8)**

b. Enlist the properties of continuous time Fourier series. **(8)**

**Q.4** a. Find out the response y(t) of an LTI system with impulse response $h(t) = e^{-at}\ u(t)$ ; a>0 to the input signal $x(t) = e^{-bt}\ u(t)$ ; b>0 **(8)**

b. (i) Prove the Multiplication property of DTFT. **(4)**

(ii) Find the DTFT of x(n) = u(n-2) – u(n-6) **(4)**

**Q.5** a. Give the time domain and frequency domain analysis of First order Continuous-Time systems. **(8)**

b. Explain Sampling theorem. How is sampling done with Zero Order Hold? What is Aliasing? **(8)**

**Q.6** a. (i) Find out the LT of $x(t) = 3e^{-2t}\ u(t) – 2e^{-t}\ u(t)$ and sketch the ROC in s-plane . **(4)**

(ii) Find out the Inverse LT of $X(s)=\frac{1}{(s+1)(s+2)}$ when ROC: Re(s) > -1 **(4)**

b. Find the LT of $x(t) = t\, e^{-a\,t}\, u(t)$ using the properties of LT. **(8)**

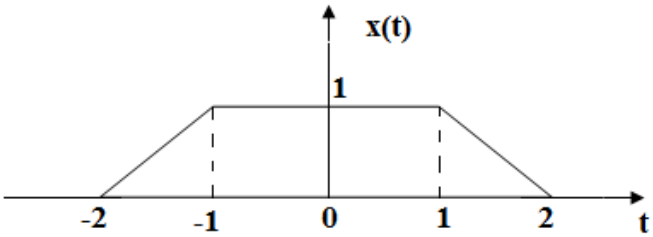
**Q.7** a. (i) If $X(z) = 2+3z^{-1}+4z^{-2}$. Find the initial and final values of the corresponding sequence x(n). **(4)**

(ii) Find the z transform of $x(n) = 7\,(1/3)^{n}\,u(n) - 6\,(1/2)^{n}\,u(n)$ **(4)**

b. Using partial fraction expansion method determine the inverse z- transform of $X(z)=\frac{3-\frac{5}{6}z^{-1}}{\left(1-\frac{1}{4}z^{-1}\right)\left(1-\frac{1}{3}z^{-1}\right)}\;|z|>\frac{1}{3}$ **(8)**

**Q.8** a. (i) Find the Fourier transform of the signal x(t) **(4)**

(ii) Find the convolution using waveform method of signals $x(t)=e^{-at}u(t)$ and $h(t)=tu(t)$. **(4)**




b. Find mean, variance and standard deviation of uniform PDF in $[-2n,2n]$. **(8)**

**Q.9** a. Define mean of a strictly stationary random process X(t). Also define Autocorrelation function and mention its properties. **(8)**

b. What is Power Spectral Density? Give its properties. **(8)**