

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
(C) Both

- (B) Non Causal
(D) None

b. Step function $u(t)$ is obtained from impulse function $\delta(t)$ by

- (A) Integrating
(C) Double Integration

- (B) Differentiating
(D) Differentiating twice

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

- (A) Non linear
(C) Linear

- (B) Unstable
(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
(C) t^3

- (B) t
(D) $1/t$

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

- (A) 2π
(C) $\pi/2$

- (B) π
(D) $3\pi/2$

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) $4\pi/T$
(C) $3\pi/T$

- (B) π/T
(D) $2\pi/T$

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

- (A) $1/(j\omega + 1)$

- (B) $1/(j\omega - 1)$

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

Each question carries 16 marks.

- 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)

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

b. Find the LT of $x(t) = t e^{-at} u(t)$ 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)

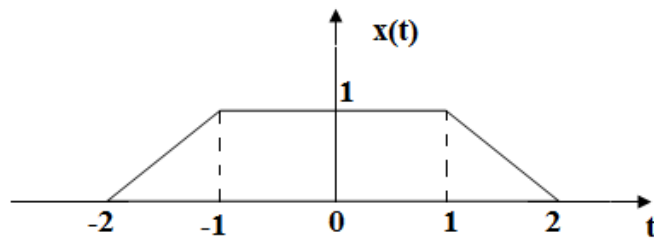
(ii) Find the z transform of $x(n) = 7 \left(\frac{1}{3}\right)^n u(n) - 6 \left(\frac{1}{2}\right)^n u(n)$ (4)

b. Using partial fraction expansion method determine the inverse z- transform

$$\text{of } X(z) = \frac{3 - \frac{5}{6}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - \frac{1}{3}z^{-1}\right)} \quad |z| > \frac{1}{3} \quad (8)$$

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)