Roll No. | | | | | | | | | | | | |

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(Electronics Engg.) (2012 Onwards)
B.Tech.(ECE/ETE/Electronics & Computer Engg.) (2011 Onwards)
(Sem.–4)

SIGNAL AND SYSTEMS

Subject Code : BTEC-402
M.Code : 57594

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Q1. Answer briefly :

a) Differentiate between continuous time and discrete time systems.

b) Determine whether the system is linear or non-linear $y(n) = x(n^2)$.

c) State Parseval's relation for discrete-time aperiodic signals.

d) Give the significance of ROC in Z-transform.

e) Determine the Nyquist sampling rate and Nyquist sampling interval for the signal $x(t) = \sin c^2 (200\pi t)$.

f) What is the necessary and sufficient condition on impulse response for stability of a causal LTI system?

g) What do you mean by statistical independence?

h) What are the Dirichlet's conditions of Fourier series?

i) How can you classify Random processes?

j) List two properties of DTFT.

SECTION-B

Q2. Find the trigonometric Fourier series for the periodic signal shown

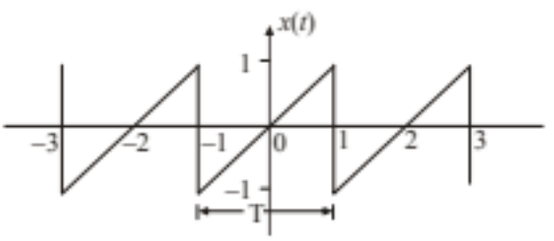

Fig.1

Q3. Consider the probability density $f(x) = ae^{-b|x|}$ where x is a random variable whose allowable value range from $x = -\infty$ to $x = +\infty$. Find :

a) The cumulative distribution function F(x)

b) The relationship between a and b and

c) The probability that the outcome x lies between 1 and 2.

Q4. Determine the Z-transform and sketch the ROC of :

$$x(n) = \begin{cases} \left(\frac{1}{3}\right)^n, & n \geq 0 \\ \left(\frac{1}{2}\right)^{-n}, & n < 0 \end{cases}$$

Q5. What is Fourier transform? Write down its properties.

Q6. A discrete random variable has k equally likely possible values 0, a, 2a, 3a

(k–1) a. Find mean, second moment and standard deviation.

SECTION-C

Q7. The input and output of a causal LTI system are related by the differentia equation,

$d^2y(t)/dt^2+6dy(t)/dt+8y(t)=2x(t)$

a) Find the impulse response of the system.

b) What is the response of this system if $x(t) = t\, e^{-2t}\, u(t)$

Q8. a) Find whether the following signals are periodic or not?

i) $x(t) = 2\cos(10t + 1) - \sin(4t-1)$

ii) $x(t) = 3\cos 4t + 2\sin t$

b) Determine whether the following signals are energy signals or power signals and why?

i) $x(t) = e^{-at}$

ii) $x(t) = \sin \omega_1 t + \cos \omega_2 t$

Q9. a) A box contains 3 red, 4 white and 5 black balls. One ball is drawn at random. Find the probability that it is :

i) red ball

ii) not black ball

iii) black or white ball.

b) In a random experiment a trial consists of five successive tosses of a coin. If we define a random variable X as the number of tails appearing in a trial, determine and plot CDF for the random variable.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.