UNIVERSITY OF PUNE

[4363-15]

T.E.(Instrumentation & Control) Examination-2013

Signals & Systems

(2003 pattern)

Time-Three hours **Maximum Marks-100**

[Total No. of Question=12] **[Total no. of printed pages= 4]**

Instructions:

(1)Answer any 3 questions from each Section.

(2)Answers to the two sections should be written in separate answer books.

(3)Neat diagrams must be drawn whenever necessary.

(4)Assume suitable data if necessary.

(5)Use of electronic pocket calculator is allowed.

SECTION-I

Q.1 (a)Which are the different types of signals? Explain in detail the operations performed on the signal. (10)

(b)Determine the convolution of the following. (8)

$$x(n) = \{1, -1, \underset{\uparrow}{3}, 0, 4\}$$

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

Q.2 (a)Explain the following terms in detail. (10)

(i)casual and non casual Systems.

(ii)Static and dynamic systems.

(iii)Linear and Non-Linear systems.

(iv)Shift variant and Shift invariant systems.

(v)Stable and unstable systems.

(b)Explain in detail the properties of convolution. (8)

Q.3 (a)Find the inverse Laplace transform of: (8)

(i) $X(s)=\frac{1}{s(s+2)^2}$,Re(s)>-2

(ii) $X(s)=\frac{s}{s^2+9s+18}$

(b)State and prove the convolution property of the Laplace transform. (8)

OR

Q.4 (a)Determine the initial and final values for each of the following. (8)

(i) $X(z)=\frac{z-\frac{1}{12}}{(z-0.5)(z-0.833)}$

(ii) $X(z)=\frac{1}{z^2-4z+1}$

(b)Write a short note on initial and final value theorem of the z-transform. (8)

Q.5 (a)Explain the relation between the Fourier transform and the z-transform. (8)

(b)The differential equation of the system is given as, (8)

$$\frac{dy(t)}{dt}+9y(t)=\frac{dx(t)}{dt}$$

Determine the frequency response and the impulse response of the system.

OR

Q.6 (a)Give the limitations of the Fourier transform. Also give the applications

of the Fourier transform. (8)

(b)State and prove the properties of the DTFS. (8)

SECTION-II

Q.7 (a)Write a short note on: (8)

(i)Energy spectral density function.

(ii)Power spectral Density Function.

(b)Find the auto correlation of the following signals,

(i) $x(n)=\{1,-3,4,5,5,-4\}$

(ii) $x(n)=u(n)$;for $0\le n\le 3$

OR

Q.8 (a)Explain the difference between cross correlation and auto correlation. (8)

Enlist the applications of the correlation.

(b)Compute the auto correlation of the following signal using the graphical method. (8)

$x(n)=1,0,1,0$

Q.9 (a)State and explain the following terms. (8)

(i)Random variables

(ii)Continuous random variables

(iii)Discrete random variables.

(b)Define the following. (8)

(i)Mean

(ii)Variance

(iii)Moments

(iv)Mean square

OR

Q.10 (a)Distinguish between the CDF and PDF. (8)

(b)Write a short note on: Binomial Distribution Function. (8)

Q.11 (a)Explain in detail Frequency division multiplexing. (10)

(b)What do you mean by modulation? Why modulation is needed.Explain the different techniques of modulation. (8)

OR

Q.12 (a)Write short notes on: (18)

(i)Pulse width Modulation

(ii)Frequency division multiplexing.

(iii)Continuous modulation techniques.