4E1228

Roll No.

Total No of Pages: 3

4E1228

B. Tech. IV-Sem. (Back) Exam., Oct.-Nov - 2020

Electrical & Electronics Engineering

4EX4-07 Signals & Systems

EE, EX

Time: 2 Hours

Maximum Marks: 82
Min. Passing Marks: 29

Instructions to Candidates:

Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Explain even and odd signals.

Q.2 Define continuous time exponential and discrete time exponential.

Q.3 Check whether the following system is casual or not- $y(t) = x^2(t) + x(t-2)$

Q.4 Define time variant and time invariant system.

Q.5 What is LTI system?

Q.6 What is convolution?

Q.7 Write basic properties of the Fourier series.

Q.8 Find the Fourier transform of $x(t) = \delta(t)$

Q.9 Write the statement of sampling theorem.

Q.10 What is Aliasing?

PART – B

(Analytical/Problem solving questions) **[4×8=32]**

Attempt any four questions

Q.1 Find whether the following signals are periodic. If yes find the periodicity of the signal.

(i) $x(t) = 2\cos t + 3\cos t/3$

(ii) $x(t) = 2\cos \pi t + 7\cos t$

Q.2 Determine the following system is linear or not - $5\frac{dy(t)}{dt} + y(t) = 5x(t)$

Q.3 Compute the output y(t) for a continuous time LTI system whose impulse response h(t) and the input x(t) are given by

$h(t) = e^{-at}u(t)$ and $x(t) = e^{at}u(-t)$, $a > 0$

Q.4 Determine the Fourier transform of the following periodic signal $x(t) = \sin(2\pi t + \pi/4)$

Q.5 Explain the properties of Laplace transform in detail.

Q.6 Determine the signal x(n) whose z transform is given by $X(z) = \log(1 + az^{-1})$: $|z| > |a|$

Q.7 Explain interpolation technique for the reconstruction of signal from its samples.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 Let $x[n] = \delta[n] + 2\delta[n-1] - \delta[n-3]$ and $h[n] = 2\delta[n+1] + 2\delta[n-1]$.

Compute and plot each of the following convolution –

(a) $y_1(n) = x[n] * h[n]$

(b) $y_2(n) = x[n+2] * h[n]$

Q.2 Verify Parseval's theorem for the following discrete time sequence - $x(n)= \left(\frac{1}{2}\right)^n .u(n)$

Q.3 A stable system has input x(t) and output y(t). Use Laplace transform to determine the transfer function and impulse response of the system.

$x(t) = u(t)$ and $y(t) = e^{-t} \cos 2t.\ u(t)$

Q.4 Find inverse z-transform of $\frac{1}{(z-3)(z-2)}$, where

(i) $|z| < 2$ (ii) $2 \le |z| < 3$ (iii) $|z| > 3$

Q.5 For the following signals, draw the spectrum of $|X_s(\omega)|$ and find expression for x(nT) and y(t)

(a) $x(t) = 2 + \cos(100\pi t)$, for T = 0.0125 sec.

(b) $x(t) = 1 + \cos(10\pi t) + \cos(30\pi t)$ for T = 0.04 sec.
