Exam.Code:0927
Sub. Code: 6572

2074

B.E. (Electronics and Communication Engineering)

Third Semester

EC-302: Signals and Systems

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: ***Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.***

x-x-x

1. a) Distinguish casual systems from non-causal systems. Give one example of each type of systems.
b) What is aliasing? Discuss in short the possible effects of aliasing on the performance of a communication system.
c) Discuss and prove the 'differentiation in time domain' property of Laplace transform.
d) Explain in short advantages of the state space analysis.
e) Discuss the importance of region of convergence in Laplace and Z-transform.
2 X 5 = 10

PART-A

2. a) Discuss and explain in detail with the aid of a diagram the linear model of a mechanical system. 6

b) Check linearity, time invariance, causality and memory for the following systems:

$$y[n] = (n+1)^2 x[n]$$ 4

3. a) Find the convolution of the following two continuous-time signals. 6

$$x(t) = e^{-|t|}, for\ all\ t\ and\ h(t) = \begin{cases} e^{-2t}, t \geq 2 \\ 0, \quad t < 2 \end{cases}$$

b) Discuss the process of impulse train sampling in detail. 4

4. a) Let $x(t) = e^{-2t}u(t) and\ let\ y(t) = x(t+1) + x(t-1)$. Find the Fourier transform of $y(t)$. 5

b) Find the Fourier series coefficients of the periodic signal shown in Fig. 1. 5

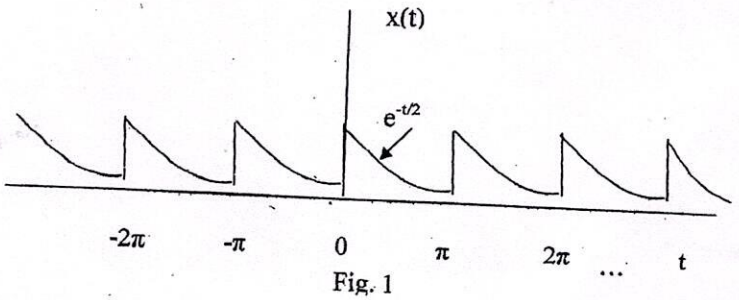

Fig. 1

PART-B

5. a) Find the Fourier series coefficients of the discrete time signal given below

$$x(n) = 1 + \sin\left(\frac{4\pi}{21}n\right) + \cos\left(\frac{10\pi}{21}n\right)$$

Also sketch the magnitude & phase spectrum. 5

b) Find the Fourier transform of $x(n) = a^{|n|}, |a| < 1$. Plot its spectrum also. 5

6. a) Find the unilateral Laplace transform of

$$x(t) = e^{-2(t+1)}u(t+2)$$

and also plot its ROC. Also, compare this with the bilateral Laplace transform of $x(t)$ and its ROC. 6

b) Explain the concept of state space analysis by discussing the definitions of state, state variables, state vectors, state space and selection of state variables. 4

7. a) Determine the sequence $x(n)$ for the two ROCs:

$(i)|z| > \frac{1}{3}$ and $(ii)\ \frac{1}{4} < |z| < \frac{1}{3}>$, where

$$H(z) = \frac{1-\frac{7}{12}z^{-1}}{[1-(4z)^{-1}][\,1-(3z)^{-1}]}$$ 6

b) Discuss in detail the relationships between Laplace and Fourier transform, Z-transform and Fourier transform. 4

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