53 (EC 302) SISY

2013

(May)

LINEAR SIGNALS AND SYSTEMS

Paper : EC 302

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Define unit impulse function, unit step function and signum function. 6

(b) Explain the analogy between signal and vector. 6

(c) Expand the following in Fourier series — 4×2=8

(i) $sin(wt)$

(ii) $u(t)$

2. *(a)* Derive the Fourier transform equation from Fourier series. 10

(b) State the Dirichelet's conditions. 4

(c) Find the Fourier transform of

(i) $u(t)$

(ii) $t\,u(t)$ 6

3. *(a)* State *any four* properties of Fourier transform. 8

(b) What are LTI and LTV systems ? 6

(c) What are causality and stability of LTI system ? 6

4. *(a)* Explain the concept of convolution in time domain and frequency domain. 6

(b) State and prove convolution theorem. 6

(c) State *any three* properties of autocorrelation function. What is the relation between autocorrelation function and power spectral density ? 8

5. *(a)* What is sampling ? State the sampling theorem and prove it for band limiting signal. 8

(b) What is aliasing ? How it can be removed ? 6

(c) What are natural and flat top sampling ? 6

6. (a) Find the Laplace transform of 3×4=12

(i) $\sin wt$

(ii) $\cos wt$

(iii) $t\,u(t)$

(iv) e^{-at}

(b) Explain the concept of ROC of Laplace transform. 5

(c) What is the relation between Laplace transform and Fourier transform ? 3

7. (a) Find Z-transform of 4×2=8

(i) $U[OH]$

(ii) $0 \cdot 5\,U[n] - U[-n-1]$

(b) Write short notes on — 6×2=12

(i) Hilbert transform

(ii) Orthogonality in complex functions.