



FACULTY OF INFORMATICS

B.E. 2/4 (IT) II Semester (Suppl.) Examination, January 2012

SIGNALS AND SYSTEMS

Time: 3 Hours]

[Max. Marks: 75

Note: Answer *all* questions from Part A. Answer *any five* questions from Part B.

PART – A

(25 Marks)

1. Sketch the signal $\pi\left(\frac{t-1}{2}\right)$. 3
2. Write the conditions for the existence of Fourier series. 2
3. Find the Fourier transform of Sign(t). 2
4. Define energy spectral density of a signal. 3
5. Define scaling of sequences with an example. 3
6. State Nyquist sampling theorem. 2
7. Distinguish between convolution and correlation. 2
8. Find the z-transform of $\left(\frac{1}{4}\right)^n u_s(n)$. Also mention the ROC. 3
9. When a system is said to be time-invariant ? 2
10. What is an integrator ? Define an all-integrator Block diagram. 3

PART – B

(50 Marks)

11. a) Derive the cosine Fourier series from trigonometric Fourier series. 5
- b) Explain the effect of time scaling and time shifting on the unit pulse function. 5

12. a) Explain about any 5 properties of Laplace transform with suitable examples. 5

b) Find the inverse Fourier transform of $X(\omega) = T \text{Sa}\left(\frac{\omega T}{2}\right)$. 5

13. a) Explain about coding and quantization. 6

b) With suitable examples, discuss about addition and multiplication of sequences. 4

14. a) Explain about discrete convolution of signals. 4

b) If $x(z) = \frac{z}{(z-0.5)(z-1)}$, $\text{Roc} = |z| > 0.5$. Find $x(n)$. 6

15. a) Find the all-integrator block diagram from the given state space

$$\text{equations. } \dot{\vec{q}}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{bmatrix} \begin{bmatrix} q_1(t) \\ q_2(t) \\ q_3(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} x(t)$$

$$y(t) = [2 \ 1 \ 3] \vec{q}(t) \quad 7$$

b) Define the following system properties. 3

i) Causal ii) Time invariance iii) Relaxed

16. a) Solve the difference equation using z-transform 5

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

$$y(1) = -1, y(0) = 0, x(n) = \delta(n).$$

b) If Fourier transform of $x(t)$ is $X(\omega) = \frac{6+j\omega}{\omega^2+3j\omega+2}$, find the Fourier transform of $x(5t)$. 5

17. Write short notes on:

a) Discrete time power signals. 4

b) BIBO stability. 3

c) Partial Fraction Expansion. 3