



FACULTY OF INFORMATICS  
B.E. 2/4 (IT) II Semester (Main) Examination, June 2010  
SIGNALS AND SYSTEMS

Time: 3 Hours]

[Max. Marks: 75

- Instructions: 1) Answer all questions from Part A.  
2) Answer any five questions from Part B.*

PART – A

(25 Marks)

1. Define Time scaling and Time shifting properties of signals. 2
2. Write the conditions for the existence of a Fourier series. 3
3. What is the relationship between Fourier transform and Laplace transform ? 2
4. Find the energy spectral density of the signal,  $x(t) = e^{-\alpha t} u_s(t)$ ,  $\alpha > 0$ . 3
5. State the Nyquist sampling theorem. 2
6. Distinguish between coding and quantization. 3
7. Find the z-transform of the unit impulse function. 2
8. Distinguish between convolution and correlation. 3
9. What are SISO and MIMO systems ? 2
10. Define BIBO stability of a system. 3

PART – B

(50 Marks)

11. a) Define and sketch the unit triangle function. 4
- b) Explain Time scaling, Time shifting and limits of signals each with a suitable example. 6
12. a) Write the definition of Fourier transform. Also write any six properties of Fourier transform. 7
- b) Calculate the power in the signal. 3

$$x(t) = \sum_{m=-\infty}^{\infty} \Pi(t - 2m)$$



13. a) Explain about Aliasing. What are its effects on signal sampling? 4

b) Explain about addition, multiplication and scaling of sequences with examples. 6

14. a) Find the inverse z-transform of 6

$$X(z) = \frac{1}{4(z-1)(z-\frac{1}{4})}, \text{ROC} = \{|z| > 1\}.$$

b) Write the properties of correlation integrals. 4

15. Consider the transfer functions : 10

$$H_1(s) = \frac{Y_1(s)}{X_1(s)} = \frac{100}{s^2 + 6s + 100} \text{ and}$$

$$H_2(s) = \frac{Y_2(s)}{X_2(s)} = \frac{s}{s+20}$$

a) Suppose these two systems are connected in a cascade connection where  $x_1(s)$  is the input signal to the composite system and  $Y_2(s)$  is the output signal. Draw the appropriate block diagram and find the transfer function of the composite system.

b) Also find the transfer function if these two systems are connected in a parallel interconnection structure.

16. Find the solution of the following differential equation : 10

$$\ddot{y}(t) + 6\dot{y}(t) + 8y(t) = \dot{x}(t) + x(t)$$

$$\dot{y}(0) = 3, y(0) = 1, x(t) = u_s(t)$$

17. Write short notes on : 10

a) Amplitude and phase spectra

b) Signals as sum of sinusoids

c) Sampling.