Code No. : 6249

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**

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

    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**

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

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

17. Write short notes on : **10**

    a) Amplitude and phase spectra

    b) Signals as sum of sinusoids

    c) Sampling.