

**Time: 3 Hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART- A****(25 Marks)**

- 1.a) Define Mean Square Error. [2]
- b) What is an Orthogonal function? [3]
- c) What is Signum Function? [2]
- d) Write about the properties of Hilbert Transform. [3]
- e) Define System Bandwidth. [2]
- f) What is Causality? [3]
- g) Define spectral density. [2]
- h) When the convolution and correlation equivalent? [3]
- i) What is steady state response? [2]
- j) What is the condition for Z – transform exist? [3]

**PART-B****(50 Marks)**

- 2.a) Derive the expression for computing Mean square Error in approximating a function  $f(t)$  by a set of  $n$  orthogonal functions. [5+5]
  - b) Explain about the complete set of Orthogonal functions. [5+5]
- OR**
- 3.a) Explain about the Trigonometric Fourier series. [5+5]
  - b) Write about the complex fourier spectrum. [5+5]
- 4.a) State and prove the time shifting and frequency shifting properties of Fourier transform. [5+5]
  - b) Explain about the effects of under sampling. [5+5]
- OR**
- 5.a) State and Prove Sampling Theorem for bandpass signals. [5+5]
  - b) Write about the band pass sampling. [5+5]
- 6.a) Write about the relationship between bandwidth and rise time in linear system. [5+5]
  - b) Explain about the Transfer function of a LTI system. [5+5]
- OR**
- 7.a) Explain about the Impulse response of Linear system. [5+5]
  - b) Write about the Paley-Wiener criterion for physical realization of system. [5+5]

- 8.a) Determine the convolution of two sequences  $x(n] = (1/2)^n u(n)$  and  $h(n) = (1/4)^n u(n)$ .  
b) Define Convolution Theorem in Time and Frequency domain and bring out the expression for convolution in Time domain. [5+5]

OR

- 9.a) Write about the Detection of periodic signals in the presence of Noise by Correlation.  
b) Explain about the Extraction of signal from noise by filtering. [5+5]  
10.a) State and prove Time-reversal, Time-Shifting and scaling properties with respect to Z-transform.  
b) Using differentiation property find the Z-transform of  $x(n) = n^2 u(n)$ . [5+5]

OR

- 11.a) State and Prove Initial value and Final value theorem with respect to Laplace transform.  
b) Explain about the concept of Region of Convergence (ROC) for Laplace Transforms. [5+5]

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