

- Note : :  
 1) All questions are compulsory.  
 2) Make suitable assumptions wherever necessary and state the assumptions made.  
 3) Numbers to the right indicate marks.

- Q. 1 Attempt **any two** of the following **10**
- a What are the advantages of Digital Signal Processing (DSP) over Analog Signal Processing (ASP)?
  - b What is region of convergence?
  - c With reference to z-Transform, state and the initial and final value theorem
  - d Define the terms i) Linearity ii) Causality
- Q. 2 Attempt **any three** of the following **15**
- a Define & give the graphical representation of Unit step and Unit impulse
  - b Discuss the classification of systems.
  - c Draw and explain the block diagram of an analog – to – digital converter.
  - d What is meant by sampling? State sampling theorem.
  - e What is meant by quantisation and encoding?
  - f Write a note on Dirichlet's conditions.
- Q. 3 Attempt **any three** of the following **15**
- a Find the Laplace transform of Cosine function
  - b Find Laplace transform of the periodic sawtooth waveform with period of one cycle T
  - c State any five properties of Laplace transform.
  - d Define the network transfer function & explain how to obtain output impulse & step response using transfer function.
  - e State and explain Laplace Transform and its inverse transform
  - f Obtain Laplace transform for step and Impulse Responses of Series R-L Circuit
- Q. 4 Attempt **any three** of the following **15**
- a Define z-Transform. Explain the use of z-Transform
  - b Compare the properties of tw-sided z-transform with those of one-sided z-Transform
  - c What is the condition for z-Transform to exist?
  - d Obtain the Z-Transform of  $x(n)=n^2u(n)$ .
  - e How is z-Transform obtained from Laplace transform?
  - f State and explain the properties of z-Transform.
- Q. 5 Attempt **any three** of the following **15**
- a Simple problems to check the Linearity and Causality of the signals.
  - b Explain briefly the Paley-Wiener criterion
  - c Explain stability in Linear Time Invariant system. What is the condition for a system to be BIBO stable?
  - d What is convolution? What are the properties of convolution?
  - e What is frequency response? What are the properties of frequency response?
  - f Check whether the system  $F[x(n)]= n[x(n)]^2$  is Linear and Time-Variant.

- Q. 6 Attempt **any three** of the following 15
- a Explain any 5 properties of DFT
  - b State and explain the properties of Discrete Fourier Series.
  - c Define Discrete Fourier Transform (DFT) for a sequence  $x(n)$
  - d What are the methods used to perform Fast Convolution. Explain any one method giving all the steps involved to perform Fast Convolution.
  - e Compute Linear and Circular Periodic Convolutions of the sequence  $x_1(n) = \{1,1,2,2\}$  and  $x_2(n) = \{1,2,3,4\}$  using DFT.
  - f State the relationship between DFT and z-Transform

- Q. 7 Attempt **any three** of the following 15
- a Explain the effects of windowing. Define Rectangular and Hamming window functions.
  - b Describe the Inverse Chebyshev filters.
  - c Obtain the system functions of normalized Butterworth filters for order  $N = 1$  &  $2$ .
  - d State the advantages of Digital filters.
  - e Describe elliptical filters in detail.
  - f Explain the procedure for designing an FIR filter using Kaiser window.
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