

Duration: 3 hrs

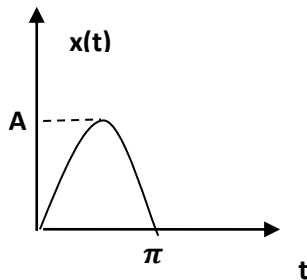
[Max Marks: 80]

- N.B. : (1) Question No 1 is Compulsory.  
 (2) Attempt any three questions out of the remaining five.  
 (3) All questions carry equal marks.  
 (4) Assume suitable data, if required and state it clearly.

1 Attempt any FOUR [20]

- Perform the convolution of  $x_1(t)=\cos t u(t)$  and  $x_2(t)=t u(t)$ ?
- Find the initial value and final value of Laplace transform:  
 $X(s) = (s+5)/(s^2(s+9))$
- Compare energy and power signals.
- What is the inverse Z transform of  $X(z) = (z - 0.4) / (z^2 + z + 2)$ ?
- If Fourier transform of  $e^{-|t|}$  is  $2/(1+\Omega^2)$  then find the Fourier transform of  $2/(1+t^2)$  using duality property

2 a Determine the Laplace transform of the waveform given below: [10]



- Find the response of the time invariant system with impulse response  $h(n)=\{1,2,1,-1\}$  to an input signal  $x(n)=\{1,2,3,1\}$  [10]

3 a Find the inverse Laplace transform of  $X(s)=4/((s+2)(s+4))$  if the ROC is, [10]

- $-2 > \text{Re}\{s\} > -4$
- $\text{Re}\{s\} < -4$
- $\text{Re}\{s\} > -4$

- Determine the impulse response of the discrete LTI system (Assume initial condition as zero): [10]  
 $y(n) - 2y(n-1) + y(n-2) = x(n) + 3x(n-3)$

4 a Determine the Fourier transform of the expression given below: [10]

$$x(t) = 1 - t^2, \text{ for } |t| < 1$$

$$= 0 \text{ for } |t| > 1$$

- b What is BIBO stability? What is the condition to be satisfied for stability? [10]  
Explain the concept of Region of Convergence (ROC) in detail.
- 5 a Where should the poles lie on the s-plane for stability of a causal system? [10]  
Explain two properties of Fourier transform.
- 5 b Determine the forced response of the system represented by the following [10]  
equation:  
 $5 \frac{dy(t)}{dt} + 10 y(t) = 2 x(t)$ , Input  $x(t) = 2 u(t)$
- 6 Write short notes on (any two) [20]
- a Analogy between correlation and convolution
  - b Relation between continuous time Fourier Transform and Laplace Transform
  - c Causality and stability of systems
  - d Finite impulse response systems (FIR) and infinite impulse response systems (IIR)
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