

(3 Hours)



Total Marks: 80

- N.B. : (1) Question No. 1 is compulsory.
 (2) Solve any **Three** questions from question no. 2 to question no. 6.
 (3) Assume suitable **data** if **required**.

1. Solve any **four** questions .

20

- (a) State relationship between Laplace and Fourier transform.
 (b) Explain Gibbs phenomenon.
 (c) State the properties of the Z transform. Derive differentiation, convolution and time shifting property.
 (d) Sketch a signal : $x(t) = u(t) - r(t-1) + 2r(t-2) - r(t-3) + u(t-4) - 2u(t-5)$
 (e) Find Fourier transform of double sided exponential signal.

2. (a) Perform convolution of following signals.

10

(1) $x(t) = e^{-t}u(t)$

$$h(t) = e^{-2t}u(t)$$

(2) $x(t) = u(t) - u(t-2)$

$$h(t) = u(t)$$

(b) For a following given signal

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Sketch the following:

- i) $x(2t-2)$
 ii) $x(2-t)$
 iii) $x((t/3)+1)$
 iv) $x((t/3)+1) \cdot u(t)$
 v) $x(t+1)$

3. (a) Determine whether following systems are static or dynamic, linear or non-linear, time variant or invariant, causal or non causal & stable or unstable.

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- i. $y(t) = t \cdot x(t)$
 ii. $y(n) = x(-n)$

(b) Check whether following signals are power or energy or neither signals. Find energy and power of signals.

6

i. $X(t) = e^{-2t} u(t)$

ii. $X(t) = 3\cos(5\omega_0 t)$

(c) Determine whether signals are periodic or not. Find out fundamental period.

4

- i. $x(t) = 2\cos\left(\frac{t}{4}\right)$
 ii. $x(t) = e^{-j2\pi t/7}$

TURN OVER



2

- 4. (a) Find inverse Z.T. of following signal for all possible ROC conditions. 10

$$X(z) = \frac{10z}{(z-1)(z-2)}$$

- (b) Find inverse Laplace transform for given two ROC conditions 10

$$x(s) = \frac{s}{(s+2)(s+3)^2}$$

ROC conditions: $-3 < \text{Re}(s) < -2$
and $\text{Re}(s) > -2$

- 5. (a) Determine the impulse response $h(n)$ for the system described by the second order difference equation: 10
 $y(n] - 4y(n-1) + 4y(n-2) = x(n-1)$

- (b) Determine Fourier transform of following continuous time domain signals. 10

- i. $x(t) = \text{Gate impulse signal}$
- ii. $x(t) = t e^{-2t} u(t)$

- 6. (a) Determine the trigonometric form of the Fourier series of the ramp signal shown in fig. below: 10



- (b) Find Laplace transform of following & draw R.O.C. 10

- i) $x(t) = tu(t) * e^{-3t}u(t)$

- ii) $x(t) = e^{-2t}u(t) + e^{-t}u(t)$