



Q.P. Code : 597802

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No.1 is compulsory.
(2) Attempt any 3 out of 5 questions.
(3) Assume suitable data if required.

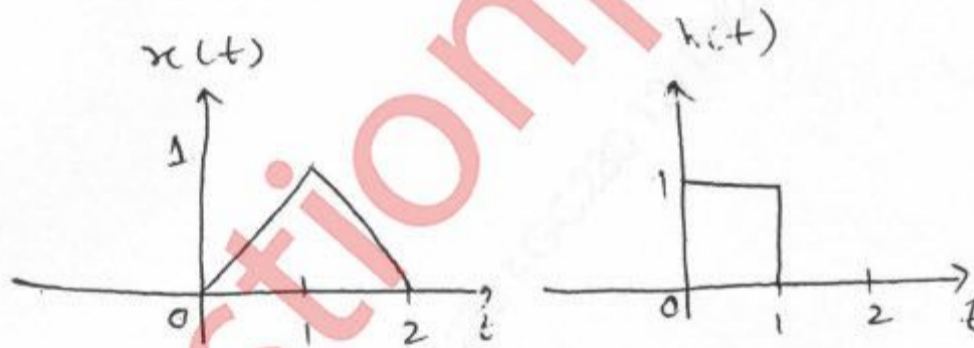
1. Solve the following [any four]

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- (a) Find the Laplace transform of following signal
 $x(t) = e^{2t}u(-t) + e^{3t}u(t)$.
- (b) Determine whether the signal is energy or power $x(t) = e^{-2t}u(t)$.
- (c) Plot the signal with respect to time.
 $x(t) = u(t) - r(t-1) + 2r(t-2) - r(t-3) + u(t-4) - 2u(t-5)$
- (d) Find the Z-T of signal and specify ROC. $x(n) = 2^n u(-n-1)$.
- (e) Determine fourier transform of signal $x(t) = \cos \omega_0 t$.

2. (a) Obtain the convolution of 2 signals. $y(t) = x(t) * h(t)$.

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(b) Explain Dirichlet condition for the convergence of the fourier series.

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(c) Obtain the Inverse Laplace transform of $X(S) = \frac{1}{(S+1)(S+2)}$ with all ROC conditions.

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3. (a) Obtain inverse Z-T of following X [Z].

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(i) $X(Z) = \frac{Z^2 + Z}{Z^2 + 2Z + 1} \quad |Z| > 1$

(ii) $X[Z] = Z^2 - 2Z - 1 + 3Z^{-2} + \frac{1}{2} Z^{-5}$

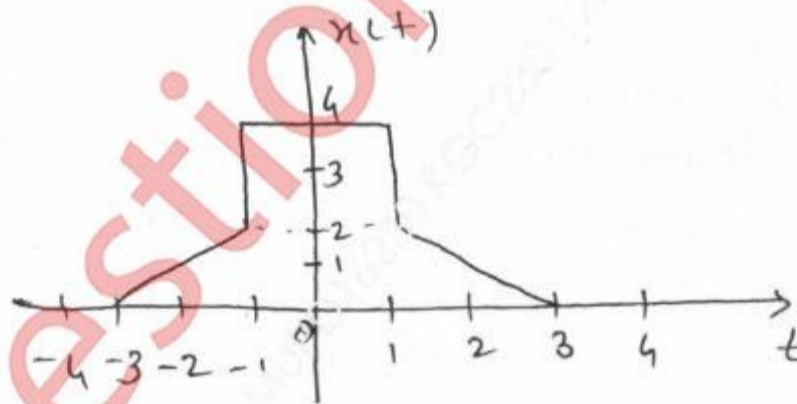
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- (b) Find and sketch fourier transform $X(\omega)$ of the non-periodic rectangular pulse at 0. $x(t) = 1$ for $|t| < T_1$
 $= 0$ for $|t| \geq T_1$ 8
- (c) Find the even and odd part of signal 4
- (i) $x(n) = u(n) - u(n-4)$
4. (a) Check whether the following systems are static/dynamic, Linear/Non Linear, Time variant / time Invariant causal/ Non causal, stable/ unstable and Invertible/Non Invertible. 8
- (i) $y(t) = 2x(t) + 2x(t-3)$.
- (ii) $y(n) = x^2(n)$.
- (b) State and prove time shifting property of fourier transform. 4
- (c) $x(t)$ signal is shown below. Sketch 6

(i) $y_1(t) = 2x\left(\frac{t}{2} - 1\right)$.

(ii) $y_2(t) = x(1-t) \cdot u(t)$

(iii) $y_3(t) = -x(2t+3)$.



- (d) Evaluate $x(t) * \delta(t-t_0)$ 2
5. (a) Difference equation of system is given by 10
- $y(n) = 3y(n-2) + 4y(n-1) + x(n)$ if $x(n) = (0.5)^n u(n)$ and $y(-1) = 1, y(-2) = 0$.
- Find (i) Zero input response
- (ii) Zero state response.
- (iii) Total response.
- (b) Determine whether the following signals are periodic or non periodic? 6
- If periodic find fundamental period.

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$$(i) x(t) = 2 \cos t + 3 \cos \frac{t}{3}$$

$$(ii) x(n) = e^{j\left[\frac{\pi}{4}\right]n}$$

(c) State and prove time shifting property of Z-Transform.

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6. (a) A causal LTI system has transfer function $H(Z) = H_1(Z) H_2(Z)$.

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$$H_1(Z) = \frac{1-0.2Z^{-1}}{1+0.5Z^{-1}} \quad \text{and} \quad H_2(Z) = \frac{1}{1+0.3Z^{-1}}$$

(i) If system is stable give ROC condition

(ii) Find the Impulse response.

(iii) Find system response if $X(Z) = \frac{1}{1-0.2Z^{-1}}$

(iv) Draw pole zero diagram.

(b) Discuss the Relation ship between Z transform, Laplace transform and Fourier Transform.

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(c) Impulse response of a LTI system is $h(n) = \{1, 2, 1, -3\}$

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Find out the response of the system to the input signal

$$x(n) = \{1, 2, 3, 1\}$$
