

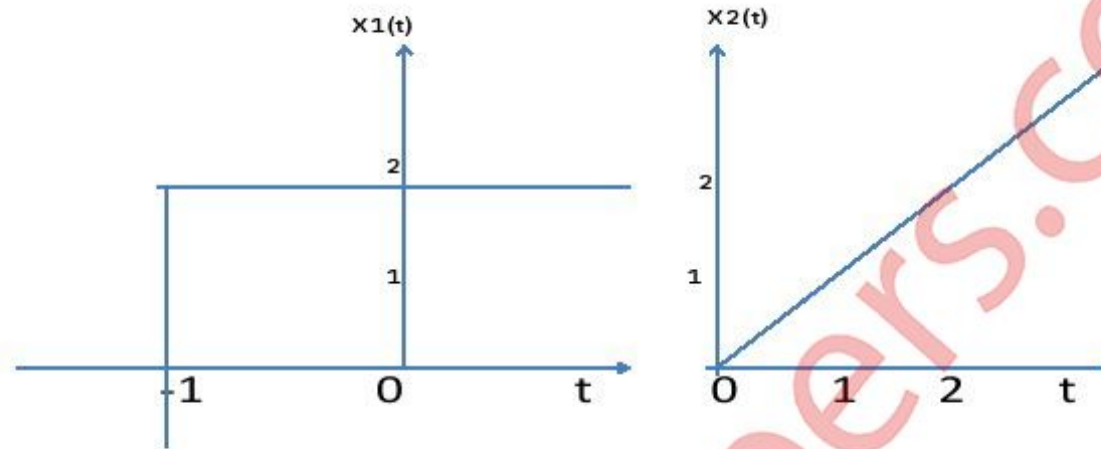
Time: 3 Hrs.**Total Marks:80****NOTE**

- 1) Question number 1 is compulsory.
- 2) Attempt any three questions from the remaining five questions.
- 3) Assume suitable data wherever necessary.

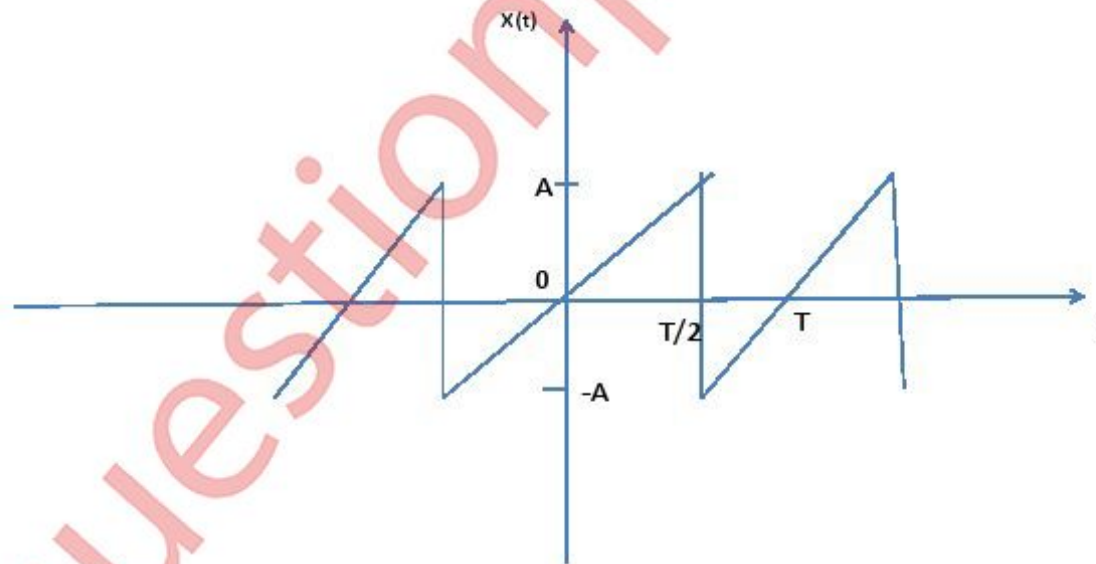
- Q1 a How will you map any point on s-plane to z-plane? 5
- b State and prove Duality property of Fourier Transform. 5
- c How will you obtain z-transform of the discrete time signal $x(nT)$, from Laplace transform of sampled version of $x(t)$, using $Z=e^{st}$. 5
- d Find the transfer function of a system having its unit step response given as: $s(t) = t u(t) + \sin(t) u(t)$ 5
- Q2 a Verify periodicity of the following continuous time signals. If periodic find the fundamental period. 4
- (i) $x(t) = 2 \cos(t/4)$
- (ii) $x(t) = e^{-j2\pi t/7}$
- b Determine power or energy of the following continuous time signal: 4
- (i) $x(t) = 3 \cos(5\pi t)$
- (ii) $x(t) = e^{j(2t+\pi/4)}$
- c Determine whether the following systems are linear/nonlinear, time variant/invariant, causal/noncausal, and stable/unstable. 12
- (i) $y(t) = e^t \cdot X(t)$
- (ii) $y(t) = \cos t \cdot x(t)$
- Q3 a State the sampling theorem. Discuss the effects of aliasing in frequency spectrum. 10
- b Determine the impulse response sequence of the discrete time LTI system defined by
- $$Y(n) - 2y(n-1) + y(n-2) = x(n) + 3x(n-3)$$
- Q4 a Determine the natural response of the system described by the equation : 10
- $$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 5y(t) = \frac{dx(t)}{dt} + 4x(t); \quad y(0) = 1; \quad \frac{dy(t)}{dt} = -2 \text{ at } t = 0$$

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- Q4 b Perform convolution of the following signals, by graphical method and sketch the resultant signal. 10



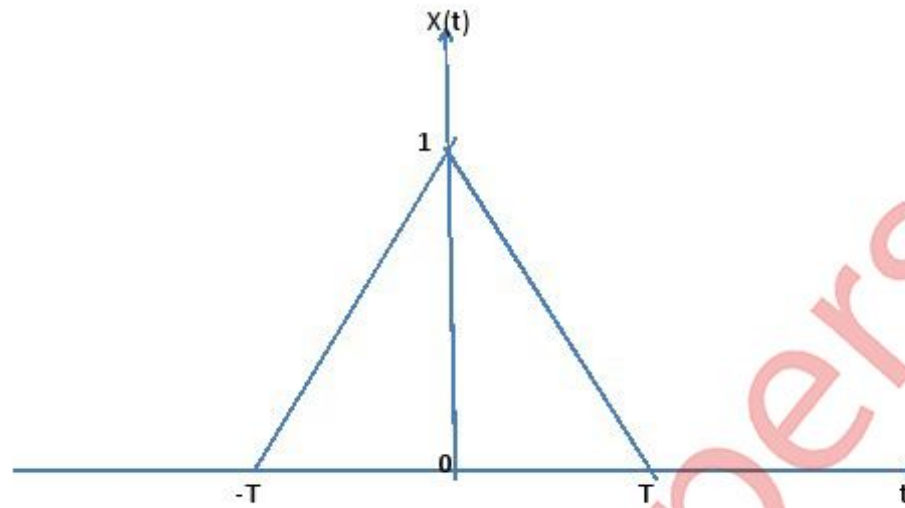
- Q5 a Determine the trigonometric form of Fourier series for the signal shown in figure:- 10



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b Determine the Fourier transform of the triangular pulse shown in figure:-

10



Q6 a Obtain inverse Laplace transform of $X(s) = \frac{4}{(s+1)(s+2)^2}$ for all possible ROC conditions. 10

b Determine the Z transform and sketch ROC 10

1) $X_1[n] = \left(\frac{1}{3}\right)^n ; n \geq 0$

2) $X_2[n] = X_1[n+4]$