E+TC)IVI CBSGS   29/5/2019

Paper / Subject Code: 39205 / SIGNALS AND SYSTEMS

(3 Hours)   [Total Marks: 80]

Question No.1 is compulsory.
Attempt any three questions out of the remaining five.
Assume suitable data wherever necessary.

1   Answer the following   20
a) Determine discrete time Fourier series of $x(n) = \cos2\left(\frac{\pi}{6}n\right)$
b) Explain in brief Region of convergence (ROC) for Laplace transform.
c) Test the causality of the following system.
      1) $y(t) = x(t) - x(t-1)$ 2) $y(t) = x(t) + 3x(t+4)$
d) Sketch signal $e^{-6t}u(t)$ and determine power and energy of signal
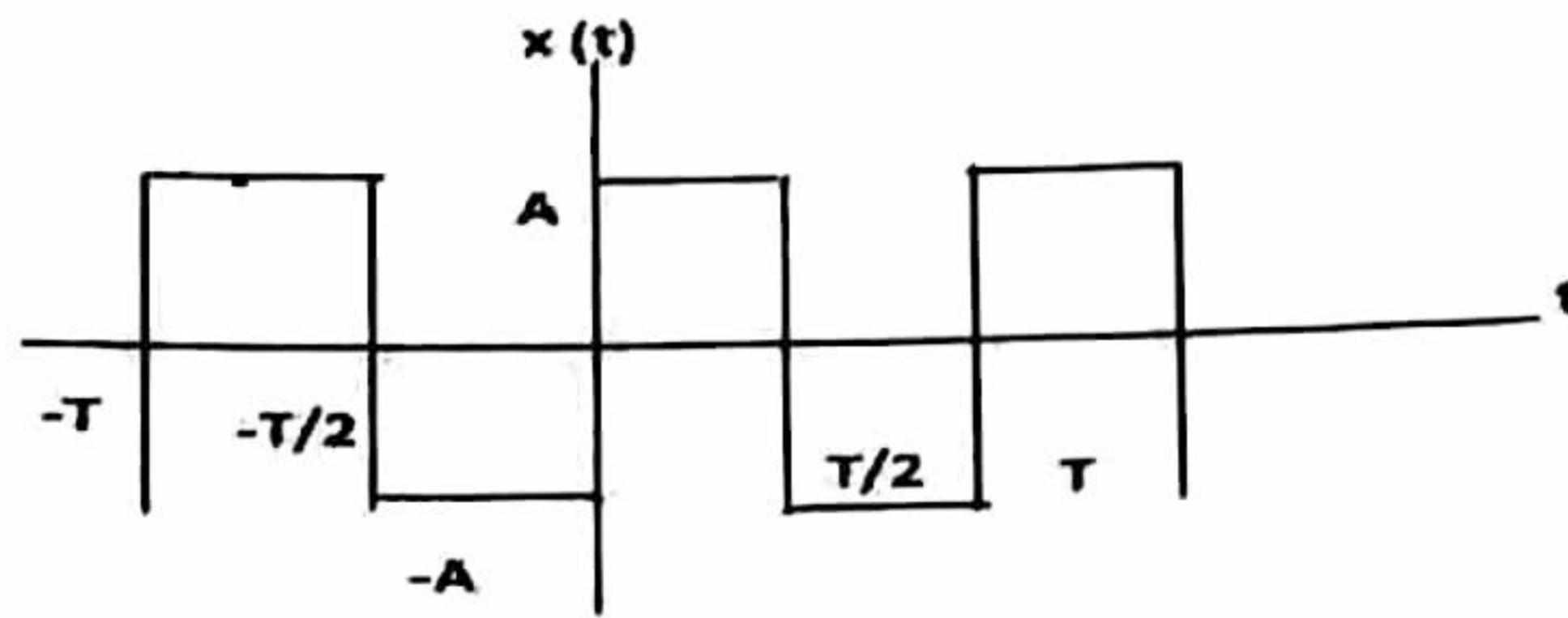e) State and prove linearity property of Z-transform

a) Obtain bilateral inverse Laplace transform of the function: 10
   $X(s) = \dfrac{3s+7}{(s^2-2s-3)}$
   Find ROC of $Re(s) > 3$
b) Determine the Fourier series of the following signal: 10

Compute the convolution $y(n) = x(n) * h(n)$ using tabulation method   10
   Where $x(n) = \{1, 1, 0, 1, 1\}$ and $h(n) = \{1, -2, -3, 4\}$

b) Determine the Fourier transform of following continuous time domain signal.   10
      i) $x(t) = 1 - t^2$ for $|t| < 1$
          $= 0$ for $|t| > 1$

A stable system has input x (t) and output y (t). Determine transfer function and   10
Impulse response h (t) by using Laplace transform.
$x(t) = e^{-2t}u(t)$, $y(t) = -2e^{-t}u(t) + 2e^{-3t}u(t)$

b) State and prove following properties of Fourier transform.   10
(i) Time shifting property
(ii) Time Reversal Property

An LTI system is described by the equation: 10
$y(n) = x(n) + 0.8 x(n-1) + 0.8 x(n-2) - 0.49 y(n-2)$, determine the transfer function of
the system and also sketch the poles and zeros on the z-plane.

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b) Obtain and sketch the impulse response of the shift invariant system described by
$$y(n) = 0.4\,x(n) + x(n-1) + 0.6\,x(n-2) + x(n-3) + 0.4\,x(n-4)$$

Q6. a) Using Z- transform, determine the response of the LTI system with impulse response
$h(n) = \{\,1\,,-1\,,1\,\}$, for an input $x(n) = \{-2\,,3\,,1\,\}$

b) Explain Gibbs Phenomenon

c) List the properties of ROC for Z- transform.

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