

[Time: 3 Hours]

Please check whether you have got the right question paper.

N.B:

1. Question No.1 is compulsory.
2. Attempt any three questions out of remaining five.
3. Assume suitable data if required.

For the following

determine whether the following signals are energy signals or power signals and calculate their energy or power.

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

2)  $x[n] = (\frac{1}{2})^n u[n]$

determine if following system is memoryless, casual, linear, time invariant.

$y(t) = 5x(t)$

determine Fourier transform of  $x(t)$  using time shifting property.

$e^{-3|t-t_0|} + e^{3|t+t_0|}$

Find out even and odd components of the following signals:

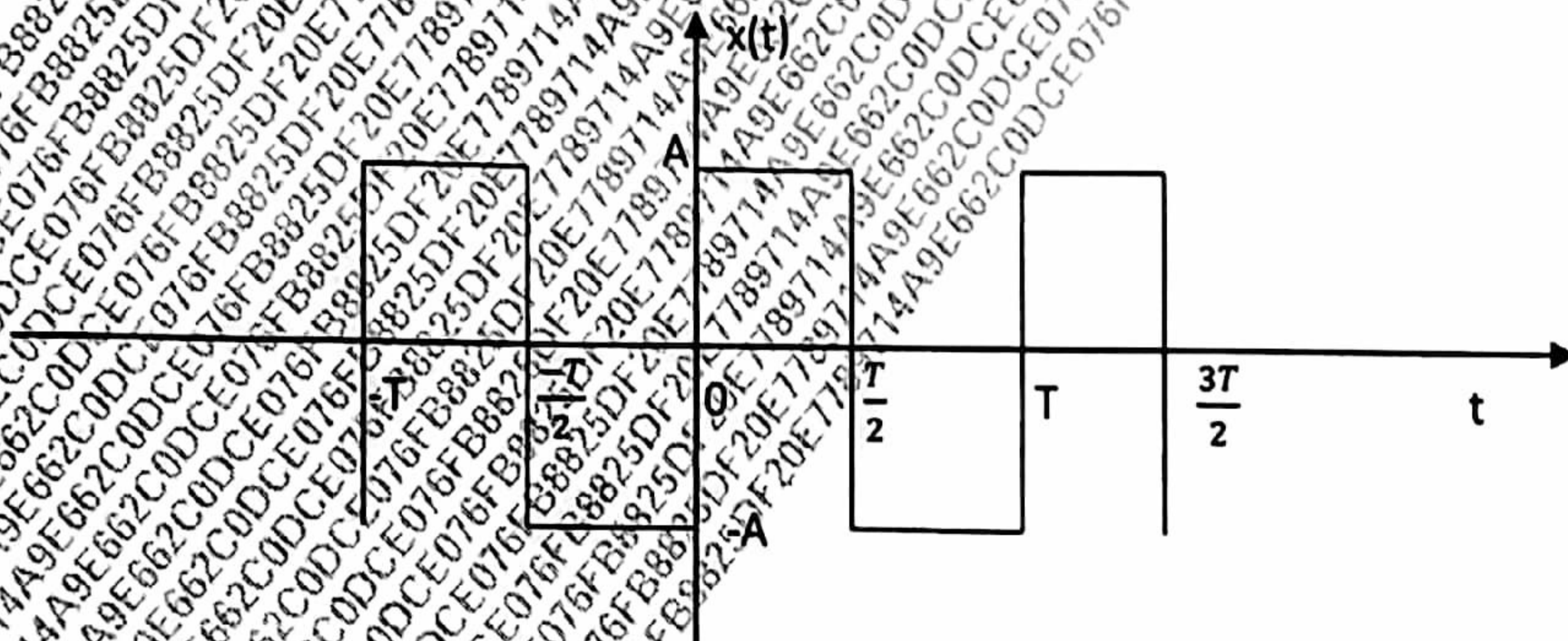
1)  $x[n] = u[n] - u[n-5]$

2)  $x(t) = 3+2t+5t^2$

Establish the relation between continuous time Fourier Transform and Laplace Transform.

determine Fourier Series representation of the following signal:

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determine impulse response of continuous time systems governed by following transfer function.

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i)  $H(s) = \frac{1}{s^2(s-2)}$

ii)  $H(s) = \frac{1}{s(s+1)(s-2)}$

continuous time signals is defined as,

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Sketch waveforms of following signals:

- (i)  $x(-t)$     (ii)  $x(2-t)$     (iii)  $x(3t)$     (iv)  $x(0.5t+1)$

Q.3 b) Determine inverse z-transform of the following function:

$$X[Z] = \log(1+az^{-1}); |z| > |a|$$

Q.3 c) Compute DTFT of sequence  $x[n] = \{0, 1, 2, 3\}$ . Also Sketch magnitude and phase spectrum.



Q.4 a) Using Laplace Transform determine complete response of system described by following equation

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 4y(t) = \frac{dx(t)}{dt} \text{ where } y(0) = 0; \left. \frac{dy(t)}{dt} \right|_{t=0} = 1, \text{ for input } x(t) = e^{-2t}u(t)$$

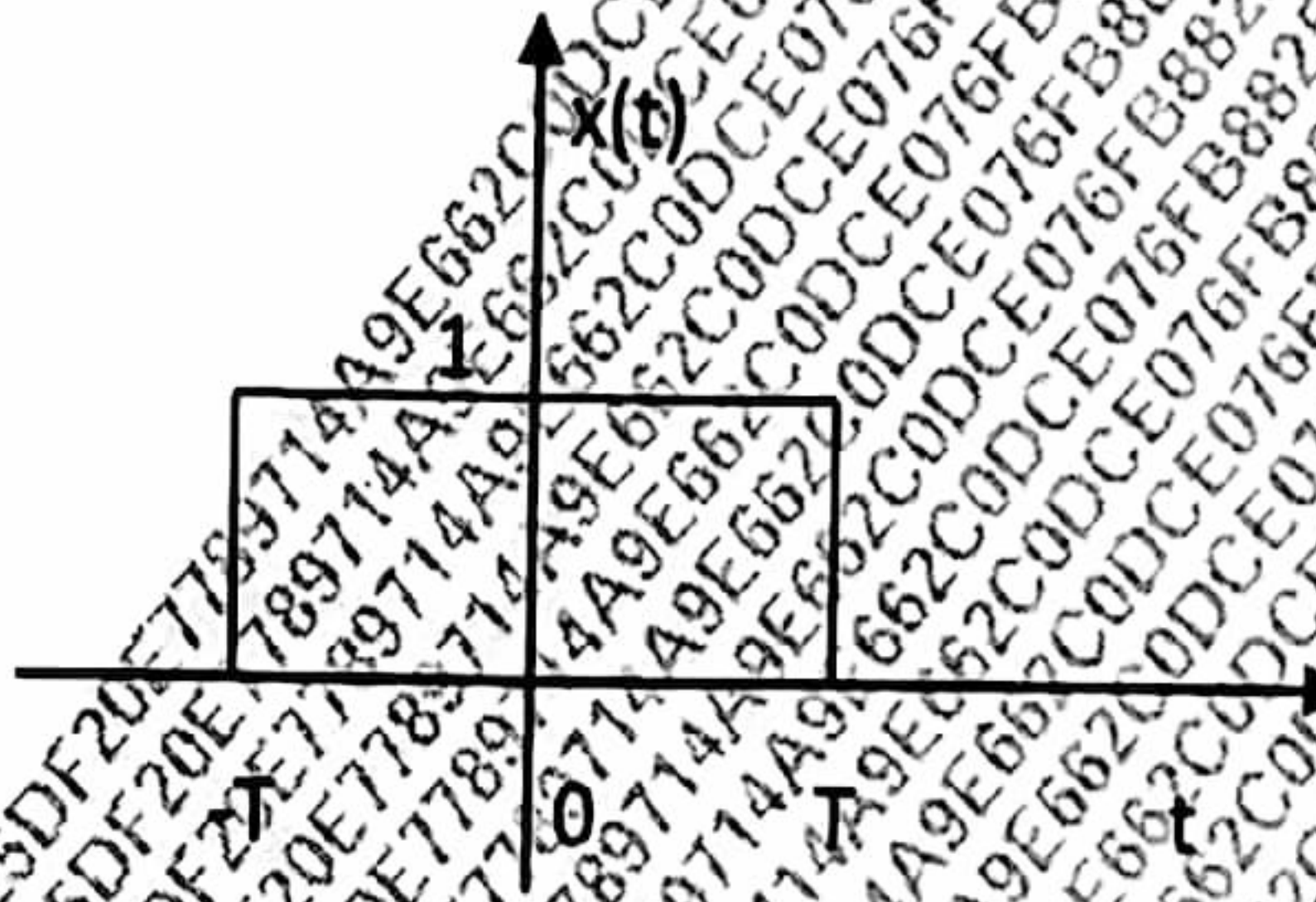
Q.4 b) Find impulse response of system described by following difference equation

$$y[n] - 3y[n-1] - 4y[n-2] = x[n] + 2x[n-1] \text{ where all initial conditions are zero.}$$

Q.5 a) For the following continuous time signals, determine Fourier Transform.

(i)  $x(t) = e^{-at} \sin \omega_0 t u(t)$

(ii)



Q.5 b) Determine Fourier series representation of  $x[n] = 4\cos\left[\frac{\pi n}{2}\right]$

Q.5 c) Determine cross correlation of sequence  $x[n] = \{1, 1, 2, 2\}$  and  $y[n] = \{1, 3, 1\}$



Q.6 a) The input signal  $x(t)$  and impulse response  $h(t)$  of a continuous-time system are described as follows

$$x(t) = e^{-t}u(t) \text{ and } h(t) = u(t-1). \text{ Find output of system using convolution integral.}$$

b) Determine Z Transform and ROC of

(i)  $x[n] = a^n u[n-1]$

(ii)  $x[n] = a^n \cos \omega n u[n]$

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