

QP Code : 534503

(3 Hours)

[Total Marks : 80

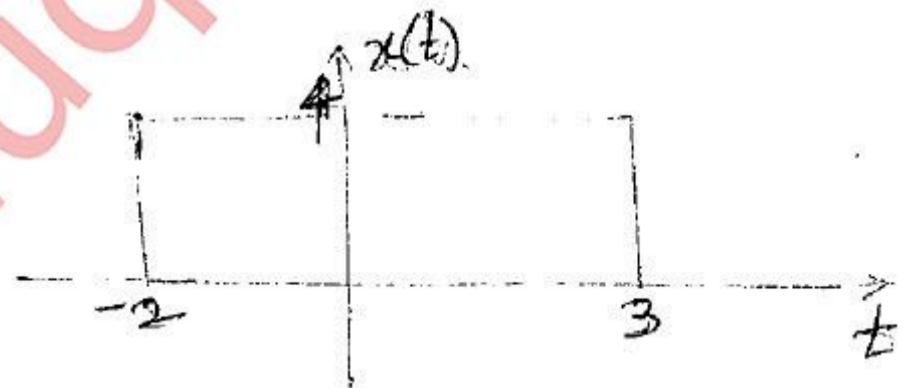
- N. B. :** (1) Question No. 1 is compulsory.
 (2) Attempt any **three** from remaining **five** questions.
 (3) Assume suitable data where ever necessary.

1. (a) Check whether the following signals are energy or power signals. Find power and energy of signal. 4
 (i) $x(n) = 2^{-n} u(n)$ (ii) $x(t) = e^{j7t}$
- (b) Check whether the following system is linear or not - stable or not, $x(n)$ is the input, $y(n)$ is the output $y(n) = \cos[x(n)]$ 4
- (c) Find double side spectrum of the signal 4

$$x(t) = 1 + \sin\left(\frac{\pi}{6}t + \frac{\pi}{3}\right) + 7 \cos\left(\frac{\pi}{3}t + \frac{\pi}{6}\right)$$
- (d) Find the output of a LTI system given by the impulse response $h(n) = (1, 2, -1)$ and $x(n) = (1, 2, -1, 3, -4, 5)$ 4
- (e) Find the z-transform of the signal $x(n) = 2^{-|n|}$; specify the ROC density. 4

2. (a) Check the following signal is periodic or not, if periodic find the period 6
 (i) $x(n) = \sin\left(\frac{8\pi n}{3} + \frac{\pi}{6}\right)$ (ii) $x(t) = e^{-j\left(7t + \frac{\pi}{3}\right)}$
- (b) Find whether the system given by the impulse response is causal or not, stable or not, justify 6
 (i) $h(n) = 2^{(n+1)} u(n)$
 (ii) $h(t) = e^{-t} u(t)$
- (c) Let $x(n) = [1, 2, 3, -4, 0, 1, -2, 3, -2, 1, 3, -2, -3, 0, 1, 2]$ 8
 Find (i) $x(2n - 2)$ (ii) $x(1 - 3n)$ (iii) $\frac{3}{2} x(n)$ (iv) $x(n) [u(n - 2)]$

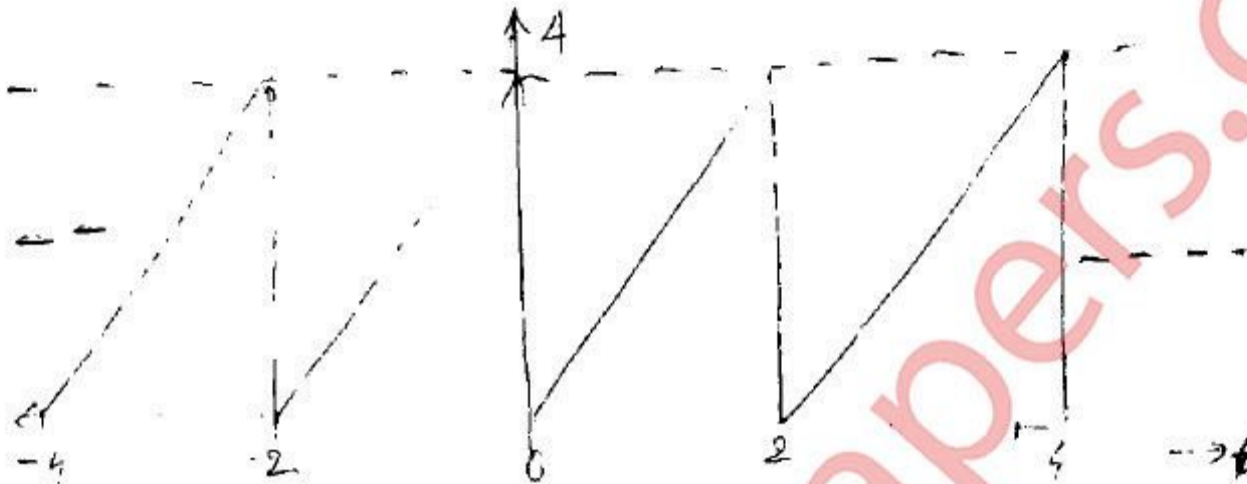
3. (a) Find even and odd part of the signal given below 6



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- (b) Find the output of the system given by the impulse response $h(t) = e^{-t} u(t)$ when the input is $x(t) = u(t+3) - u(t-4)$ 10
- (c) Find the circular convolution of the signal $x(n) = (1, 2, 1, 1)$ and $h(n) = (1, 3, -1)$ 4

4. (a) Find the exponential Fourier series-co-efficients of the periodic signal as shown below 10



- (b) Find the Fourier transform of the signal $x(t) = e^{-3(t-1)} u(t-1)$ 5

- (c) Find $x(t)$ if $X(\omega) = \frac{1}{(j\omega + 1)(j\omega + 2)}$ 5

5. (a) Find DTFS of the signal 6

$$x(n) = \cos\left(\frac{n\pi}{2}\right)$$

- (b) Compute the Laplace transform the signal $x(t) = e^{-2|t|}$ 6

- (c) Find the impulse response of the system given by the difference equation using Laplace transform method. 8

$$\frac{d^2 y(t)}{dt^2} + 6 \frac{dy(t)}{dt} + 5y(t) = 2x(t) + 3 \frac{dx(t)}{dt}$$

6. (a) Find the initial value and final value of the signal $X(s) = \frac{s+6}{(s^2-3s+2)}$ 4

- (b) Find the signal $x(n)$ if $X(z) = \frac{1}{(1+z^{-1})(1-z^{-1})^2}$ if the signal is causal. 8

- (c) Prove the convolution property of z transform. 4

- (d) Find the difference equation of the system if 4

$$H(z) = \frac{1 - z^{-1} - z^{-2}}{1 + 2z^{-2} + 6z^{-3}}$$