

SE/IV/BM/4/6/14

SE (Biomed) - Sem IV (CBGS)

Sub: SSS (Signal and systems) (1)

QP Code : NP-19803

(2)

(3 Hours)

[Total Marks : 80]

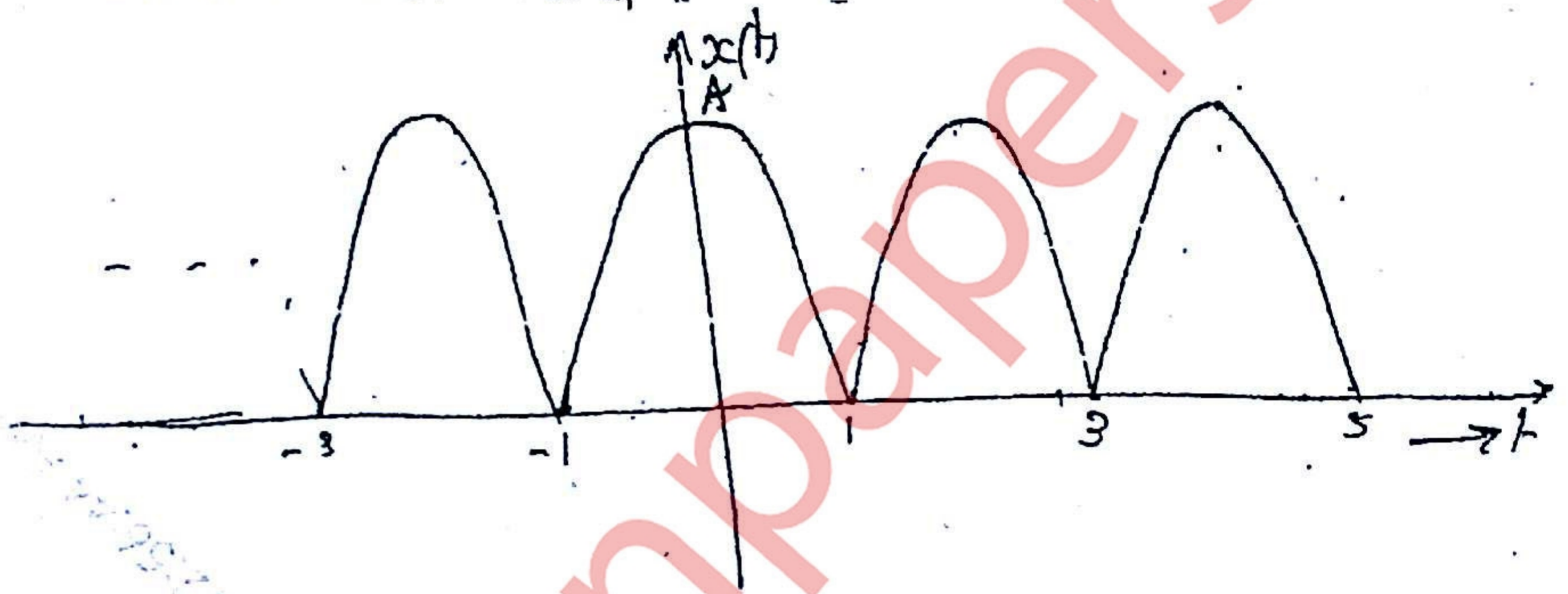
- N.B. : (1) Answer any 4 questions.
(2) Assume any data if required, mention clearly.

1. (a) Sketch the signal 5
 $x(t) = r(t) - r(t-3) - 5u(t-5) + 2u(t-7)$
- (b) Check whether the discrete time system given by the equation 5
 $y[n] = 6[n+2] \cos[x[n]]$ is causal or not linear or not, justify.
- (c) Find the Laplace transform of $x(t) = \frac{2}{3}e^{-2t}u(t) * u(t)$ 5
- (d) Find the z-transform of the signal 5
 $x[n] = 7[n+2]e^{\frac{j\pi n}{4}}u[n]$
2. (a) Find out whether the following signals are periodic or not, if periodic find period 6
(i) $x[n] = 6\sin\left(\frac{3\pi}{4}n + \frac{\pi}{3}\right)$
(ii) $x(t) = e^{j7t}$
- (b) Find the energy and power of the signals 6
 $x(t) = 6e^{j(2\pi t + \pi/3)}$
 $x[n] = 7e^{-2n}u[n]$
- (c) Find the even and odd part of the signal 4
 $x(t) = u(t) - u(t-3)$
- (d) $x[n] = 1 \quad -2 \leq n \leq 2$ 4
 $= -2 \quad 3 \leq n \leq 6$
 $= n-6 \quad 7 \leq n \leq 10.$
- sketch (i) $x[n]$ (ii) $x[2n+3]$
3. (a) Check whether the discrete time system given by the impulse response 4
 $h(t) = 2^{-t}u(t+2)$ is stable or not causal or not, Justify.
- (b) Find the response of the system with impulse response $h[n] = [1, 4, 2, 1]$ 4
when the input
 $x[n] = [2, -1, 0, 1, 3]$
 \uparrow
- (c) let $x(t) = u(t+1) - u(t-2)$ 8
 $h(t) = u(t+1) - u(t-1)$
Find $y(t) = x(t) * h(t)$ sketch the waveform.

(d) Show that the set of signals

$P_0(t) = 1, P_1(t) = t, P_2(t) = \left(\frac{3}{2}t^2 - \frac{1}{2}\right)$ are orthogonal to each other in the interval $-1 < t < 1$

4. (a) Find the exponential Fourier series co-efficients of the signal given below sketches. 7



(b) Find the Fourier transform of the signal 7

$$x(t) = \cos(\omega_0 t) u(t).$$

(c) Find the discrete time Fourier series co-efficients of the signal 6

$$x[n] = \cos\left[\frac{\pi n}{2}\right]$$

5. (a) Prove the time shifting property of CTFT. 5

(b) Prove the Parseval's relation for discrete time Fourier series. 5

(c) Consider a system with impulse response 5

$$h(t) = \delta(t) - e^{-3t} u(t) + 2e^{-t} u(t).$$

find the transfer function $H(s)$ of the inverse system.

(d) Determine the initial and final value of the signal $X(s) = \frac{7s+10}{s(s+2)}$ 5

6. (a) Find the impulse response of the system, if

6

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

If the system is (i) Causal (ii) Stable

(b) Let $X(s) = \frac{-5s-7}{(s+1)(s-1)}$, find $x(t)$ for all possible ROC. 7

(c) Let $h[n] = \delta[n] - (0.4)(0.5)^n u[n]$. Find the difference equation relating the system input and output. 7

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