

S.E-IV Sem - Biomed.
Signals & systems.

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SE/IV/CPGS/BM/SS
QP Code : 5449

(3 Hours)

[Total Marks : 80

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

1. Attempt the following questions :—

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- (a) Determine whether the signal is periodic, calculate its fundamental period

$$x(t) = 5 \cos^2 \left(5t + \frac{\pi}{6} \right)$$

- (b) Determine the energy and power of a unit step signal.
(c) Classify the following system in terms of linearity, time invariance, causality, stability.

$$y(t) = e^{2t} x(t)$$

- (d) Check the orthogonality of the signal over interval $[0, 1]$

$$x_1(t) = \sqrt{2}(1 - 2t), \quad x_2(t) = 2$$

2. (a) Find the convolution sum of by graphical method

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$$x[n] = \{1, 2, -1, 1\}$$

$$h[n] = \{2, 4, 2, 1, 3, 5\}$$

- (b) Find the initial and final value of

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$$X[s] = \frac{10(s+1)}{(s+2)(s+6)}$$

3. (a) Find the Z-transform of $x(n) = (-1)^n 2^{-n} u(n)$ and sketch the ROC.

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- (b) Find the laplace transform of $x(t) = te^{4t} u(t) * 2\sin 7t u(t)$

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4. (a) Given the signal $x(t) = 3 + t$ $-3 \leq t \leq -1$

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$$= 0 \quad -1 < t < 0$$

$$= -1 + t \quad 0 \leq t \leq 1$$

Sketch the following :

- (i) $x(t)$, (ii) $x(-t)$, (iii) $-x(t)$, (iv) $x(-t+2)$, (v) $x(t-2)$

- (b) Find the even and odd part of the signal of Q4(a).

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5. (a) Determine the inverse Z transform of :

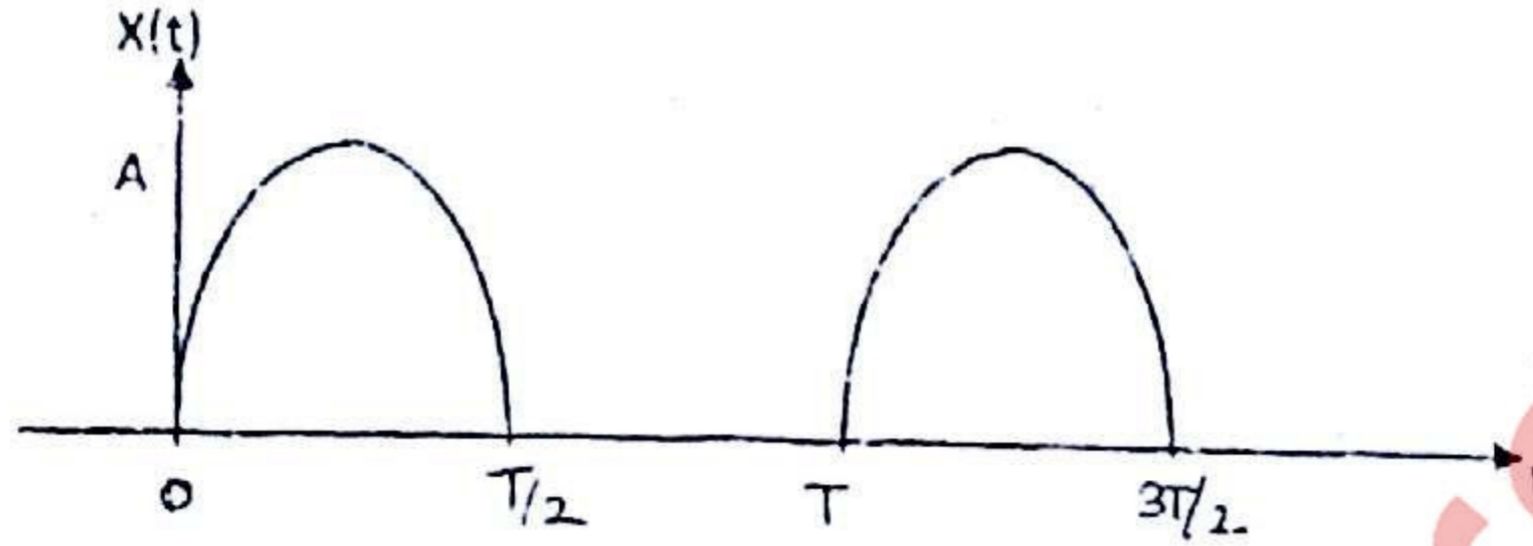
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$$X(Z) = \frac{3 + 2Z^{-1} + 2Z^{-2}}{1 - 3Z^{-1} + 2Z^{-2}}$$

By Partial fraction Expansion method.

(b) Find the laplace transform of the signal and their ROC.

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6. (a) Determine the fourier series representation of

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(i) $x[n] = 4 \cos\left(\frac{\pi}{2}n\right)$

(ii) $x[n] = \{1, 2, -1, 1, 2, -1, 1, 2, -1\}$

(b) Determine the trigonometric fourier series of

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