

Total No. of Questions : 8]

SEAT No. :

PE-4250

[Total No. of Pages : 4

[6582]-21

**S.E. (Electronics/E&Te/Electronics & Computer/
Electronics (VLSI Design & Tech.)/E.C (A.C.T.))
SIGNALS AND SYSTEMS
(2019 Pattern) (Semester - IV) (204191)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

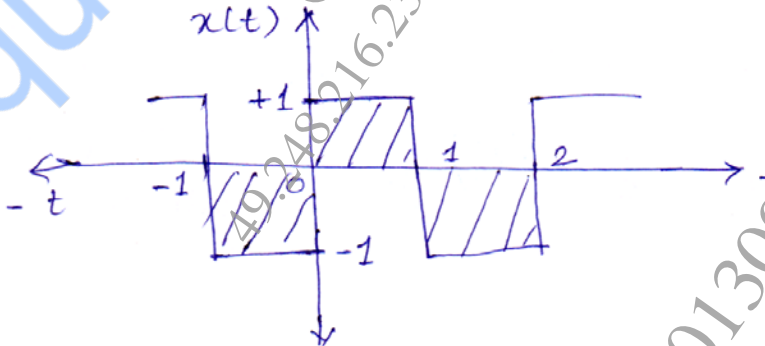
- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Assume suitable data if necessary.
- 3) Figures to the right indicate full marks.

Q1) a) State the following properties of CT Fourier Series. [6]

- i) Linearity
- ii) Time shifting
- iii) Convolution

Also, give physical significance of above properties.

b) Find the Trigonometric Fourier series for the bidirectional symmetric square waveform shown below. [6]



c) State and Explain Dirichlet conditions for the existence of Fourier Series. [6]

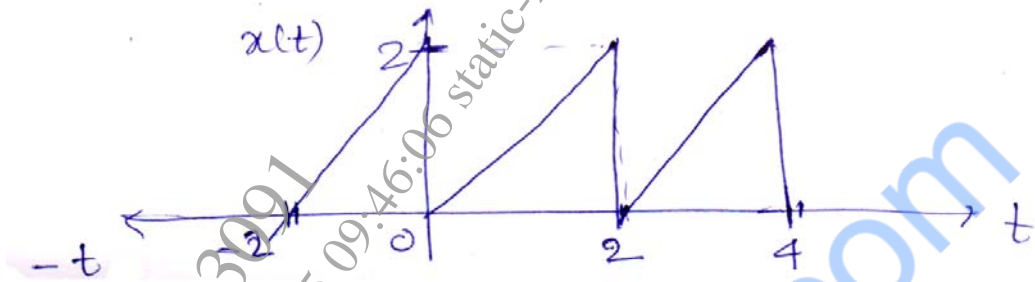
OR

Q2) a) Write a short note on Gibb's phenomenon for Fourier series. [6]

b) Check whether the two signals $\sin(\omega t)$ and $\cos(2\omega t)$ are orthogonal to each other. [6]

P.T.O.

- c) Find the exponential FS for the periodic signal shown below. [6]



- Q3) a) Find the Fourier Transform of the signal $x(t) = e^{-2t}u(t)$. Also sketch magnitude and phase response. [6]

- b) Obtain the Fourier Transform using properties. [6]

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

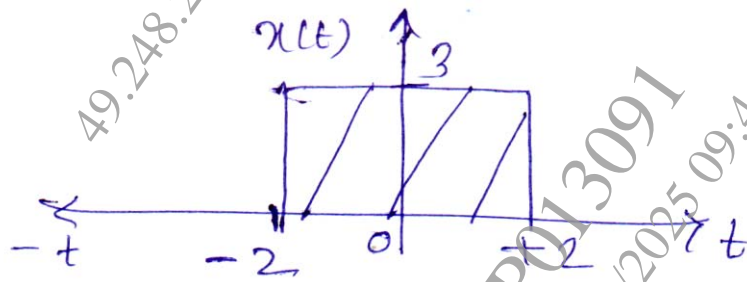
ii) $x(t) = \delta(t) * \text{sgn}(t)$

- c) State and explain the physical significance of following CTFT properties. [5]

- i) Time scaling
- ii) Modulation
- iii) Time Differentiation

OR

- Q4) a) Find the Fourier Transform of a signal shown below. [6]



- b) Find the Fourier Transform of $x(t) = \cos(\omega_0 t)$ using frequency shifting property of CTFT. [6]

- c) Define magnitude response and phase response. Explain with one example. [5]

Q5) a) Define ROC in Laplace Transform. Also, state the properties of ROC. [6]

b) Find the Laplace Transform using properties of i) $x(t-2)$ and ii) $\frac{d}{dt}x(t)$ [6]

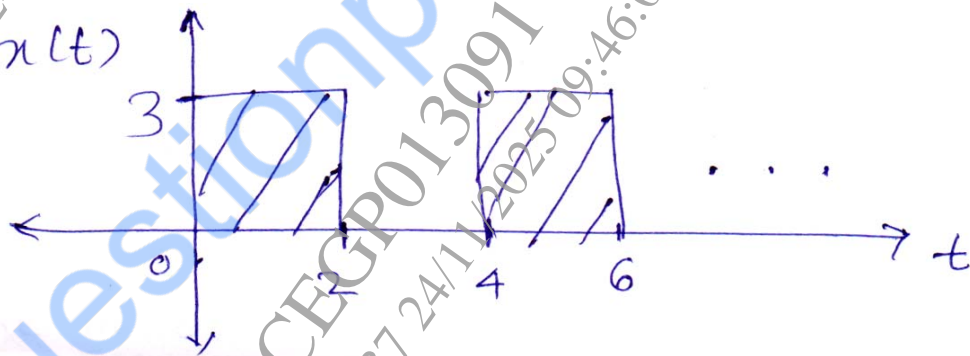
$$\text{If } X(s) = \frac{2s}{s^2 + 2}$$

c) Find the Initial and Final values of $X(s) = \frac{5s+3}{s^2+2s+4}$ [6]

OR

Q6) a) Find the Inverse Laplace Transform of $X(s) = \frac{3}{(s+4)(s-2)}$ with given ROC, $-4 \leq \text{ROC} \leq +2$ [6]

b) Find the Laplace Transform of given periodic signal. [6]



c) Compare Fourier Transform and Laplace Transform. [6]

Q7) a) State and Explain properties of PDF and CDF. [6]

b) Two dice are thrown simultaneously. Find the probability of following: [6]

- Throwing a sum of 11
- Throwing two 7's
- Throwing a pair

c) Determine mean, mean square, variance for the given Probability Density Function (PDF). [5]

$$F_x(x) = \begin{cases} x^2 & \text{for } 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

OR

Q8) a) A certain random variable has the CDF. [6]

$$F_x(x) = \begin{cases} 0, & x \leq 0 \\ kx^2, & 0 < x \leq 10 \\ 100k, & \text{for } x > 10 \end{cases}$$

Evaluate k, $P(X \leq 5)$ and $P(5 < X \leq 7)$

- b) A coin is tossed three times. A random variable X which represents the no. of tails. Obtained after the toss. Find the probabilities of X and plot the CDF. [6]
- c) Write a short note on uniform Distribution Function. [5]

