

Total No. of Questions : 8]

SEAT No. :

P9096

[Total No. of Pages : 3

[6179]-221

S.E. (Electronics/ E & TC/EC)

SIGNALS AND SYSTEMS

(2019 Pattern) (Semester - IV) (204191)

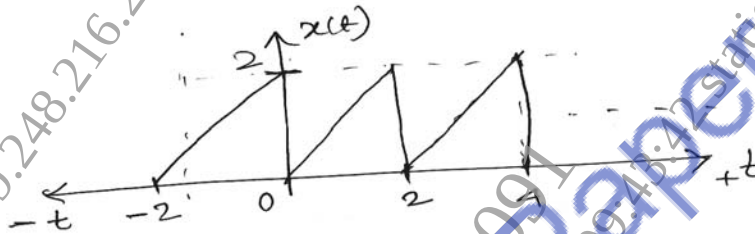
Time : 2½ Hours]

[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 required.

Q1) a) Find the Exponential Fourier series for the periodic signal shown in fig. below. [8]



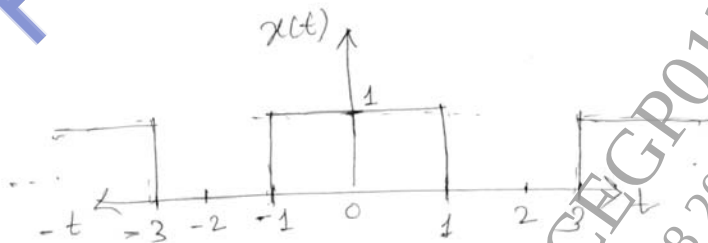
b) State the following properties of CT Fourier Series. [6]

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

c) Write short note on Basis function. [4]

OR

Q2) a) Determine the Trigonometric Fourier series for the Periodic signal given below. [8]



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

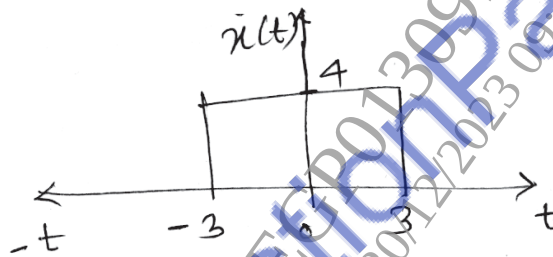
c) State the Dirichlet conditions for the existence of Fourier Series. [4]

P.T.O.

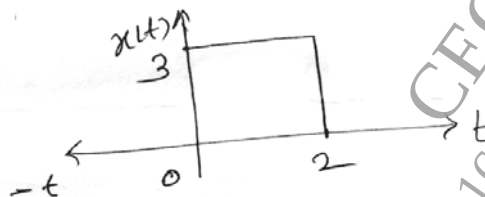
- Q3) a)** Determine the Fourier Transform of $x(t) = e^{-2t} \cdot u(t)$. Also, plot magnitude and phase spectrum. [8]
- b)** State the convolution property. Find the Fourier Transform of $x(t) = \delta(t - 1) * e^{-t} u(t)$ [6]
- c)** Explain Magnitude and phase response. [3]

OR

- Q4) a)** Find the Fourier Transform of signal given below. [8]
- i) $\cos(w_0 t)$
- ii) $\sin(w_0 t)$
- b)** Define Frequency Differentiation property. Using the same property, Find Fourier Transform of $x(t) = t \cdot e^{-2t} \cdot u(t)$. [6]
- c)** Find the Fourier Transform of following signal. [3]



- Q5) a)** Find the Laplace Transform of $x(t) = e^{-4|t|}$. Also sketch ROC for the same. [8]
- b)** Find the Laplace Transform of following signals using properties. [6]
- i) $x(t) = t^2 \cdot e^{-t} \cdot u(t)$
- ii) $x(t) = e^{-t} \cdot \cos(t) \cdot u(t)$
- c)** Find the Laplace Transform of the signal given below. [4]



OR

Q6) a) Find the Inverse Laplace Transform of $X(s) = \frac{-5s - 7}{(s+1)(s-1)(s+2)}$ with ROC specified $-2 < \sigma < -1$. [8]

b) Find the Initial value and final value of given $X(s) = \frac{6s+5}{s(2s+5)}$. [6]

c) Define ROC. List the properties of ROC. [4]

Q7) a) Define the following [9]

- i) Probability
- ii) Conditional Probability
- iii) Bayes Theorem
- iv) CDF
- v) PDF
- vi) Mean
- vii) Mean Square Value
- viii) Variance
- ix) Standard Deviation.

b) PDF of a random variable is given as $f_x(x) = e^{-x} u(x)$ [8]

Find

- i) CDF
- ii) $P(X \leq 1)$
- iii) $P(1 \leq X \leq 2)$
- iv) $P(X > 2)$

OR

Q8) a) Define Properties of probabilities. And Find the probability $P(A)$, $P(B)$, $P(C)$, $P(A \cap B)$, $P(A \cap C)$, $P(A \cup B)$, $P(A \cup C)$, $P(B \cap C)$ in an experiment consists of observing the sum of the numbers showing up when two dice are thrown. Event $A = \{\text{sum} = 7\}$, $B = \{8 < \text{sum} < 11\}$, $C = \{10 < \text{sum}\}$. [9]

b) PDF of a random variable is given as [8]

$$f_x(x) = \begin{cases} \frac{1}{a} & |x| \leq a \\ 0 & \text{otherwise} \end{cases}$$

Find

- i) Mean
- ii) Mean Square Value
- iii) Variance
- iv) Standard Deviation.

