Total No. of Questions : 8] **SEAT No. :**

P9096 **[Total No. of Pages : 3**

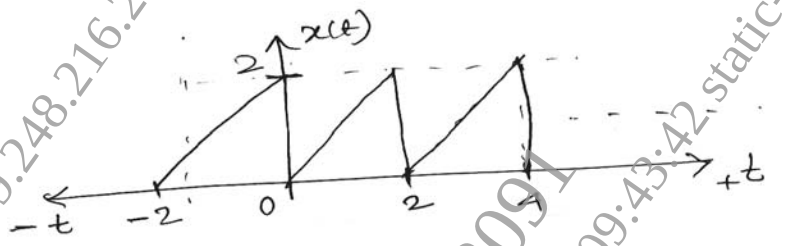
[6179]-221
S.E. (Electronics/ E & TC/EC)
SIGNALS AND SYSTEMS
(2019 Pattern) (Semester - IV) (204191)

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 Fouries series for the periodic signal shown in fig. below. **[8]**



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

i) Linearity

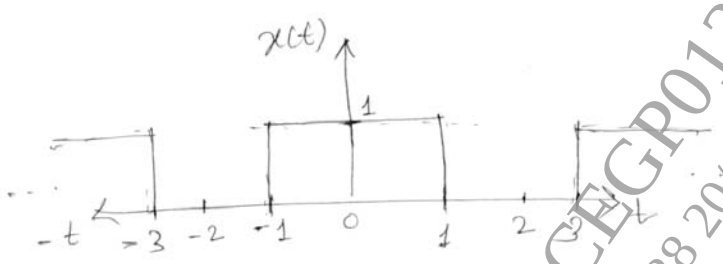
ii) Time Integration

iii) Convolution

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

OR

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



b) Check whether the two signals sin(wt) and sin(2 wt) 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 $x(t) = e^{-2t}.\ u(t)$. 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

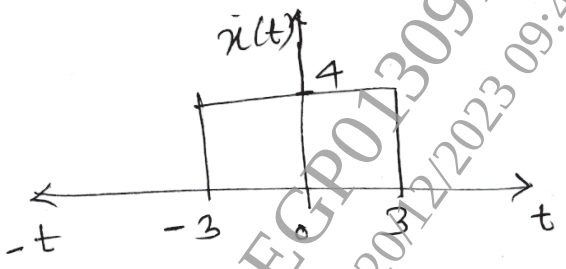
Q4) a) Find the Fourier Transform of signal given below. **[8]**

i) $\text{Cos}\ (w_0 t)$

ii) $\text{Sin}\ (w_0 t)$

b) Define Frequency Differentiation property. Using the same property, Find Fourier Transform of $x(t) = t.e^{-2t}.\ u(t)$. **[6]**

c) Find the Fourier Transform of following signal. **[3]**



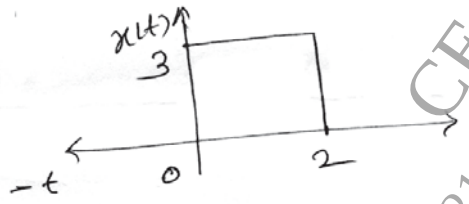
Q5) a) Find the Laplace Transform of $x(t) = e^{-4|t|}$. Also sketch ROC for the same. **[8]**

b) Find the Laplace Transform of following signals using properties. **[6]**

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

ii) $x(t) = e^{-t}.\ \cos(t).\ u(t)$

c) Find the Laplace Transform of the signal given below. **[4]**



OR

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

b) Find the Initial value and find value of given $X(s) = \dfrac{6s+5}{s(2s+5)}$. **[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) $P(X \le 1)$
iii) $P(1 \le X \le 2)$
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 = {sum = 7}, B = {8 < sum < 11}, C = {10 < sum}. **[9]**

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

$$f_X(x) = \begin{cases} \dfrac{1}{a} & |x| \le a \\ 0 & \text{otherwise} \end{cases}$$

Find

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