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

PB3616 **[Total No. of Pages : 3**

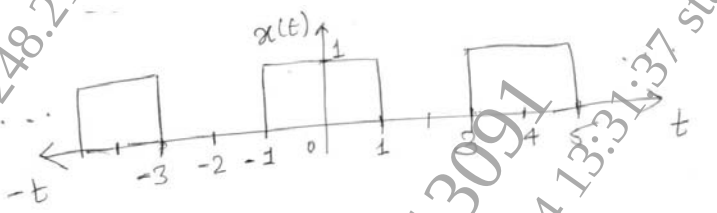
[6261]-21
S. E. (Electronics / E&Tc/E&CE)
SIGNALS AND SYSTEMS
(2019 Pattern) (Semester - IV) (204191)

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) ***Figures to the right indicate full marks.***
3) ***Draw neat figures wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of scientific calculator is allowed.***

Q1) a) Find the Trignometric Fourier series for a given signal $x(t)$ **[8]**



b) State and explain physical significance of fourier series properties given below. **[6]**

i) Time scaling

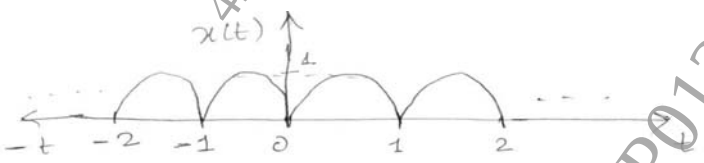
ii) Time Differentiation

iii) Time Reversal

c) Explain Gibb's Phenomenon **[4]**

OR

Q2) a) Determine exponential Fourier Series for the signal given $x(t)$. **[8]**



b) Check whether cos(wt) and cos(2 wt) are orthogonal to each other. **[6]**

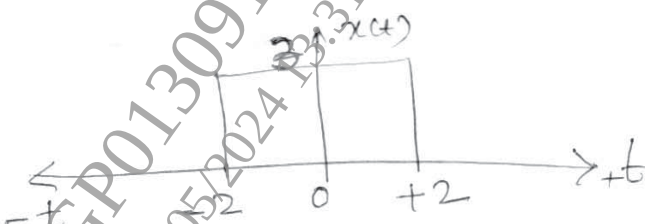
c) State Dirichlet conditions for the existence of Fourier series. **[4]**

P.T.O.

Q3) a) Determine the fourier Transform of $x(t) = e^{-3t}.\ u(t)$. Also, plot magnitude and phase spectrum. **[8]**

b) Define Frequency shifting property of CTFT and find the Fourier Transform of $x(t) = \cos(w_o t).\ u(t)$. **[6]**

c) Determine the Fourier Transform of the signal given below. **[3]**



OR

Q4) a) Find the Fourier Transform of signum(t). **[8]**

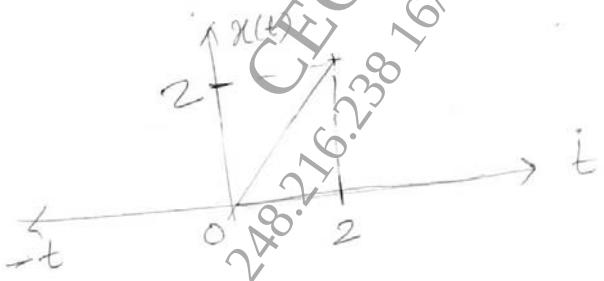
b) Find the Fourier Transform of following signals using properties of CTFT

i) $\delta(t - 3)$

ii) $3\delta(t) + 2e^{-dt}u(t)$ **[6]**

c) Explain magnitude and phase response. **[3]**

Q5) a) Determine the Laplace Transform of the signal given below. Sketch ROC. **[8]**



b) Define ROC. List the properties of ROC. **[6]**

c) Find the Laplace transform of following signals using properties **[4]**

i) $x(t) = u(t - 4)$

ii) $x(t) = r(2t)$

OR

Q6) a) Determine the Inverse Laplace Transform **[8]**

$$X(s) = \frac{2}{S(S+1)(S+2)} \text{ with}$$

ROC specified $-1 < \sigma < 0$

(σ = sigma)

b) Find the initial and final values of given function **[6]**

$$x(s) = \frac{2s+3}{s^2+5s+6}.$$

c) Compare Fourier Transform and Laplace Transform. **[3]**

Q7) a) State the properties of PDF. **[9]**

For a given CDF,

$$F_X(x) = \begin{cases} 0 & x \le 0 \\ K x^2 & 0 < x \le 10 \\ 100K & for\ x > 10 \end{cases}$$

Find K, P(X ≤ 5) and P(5 < X ≤ 7) plot the corresponding PDF.

b) Define probability. A box contains 4 white, 5 Red and 7 black balls. A ball is drawn randomly from a box. Find the probability that **[9]**

i) a ball is Red,

ii) a ball is not white

iii) a ball is back or white.

OR

Q8) a) PDF of a random variable is as given below **[9]**

$$f_X(x) = \begin{cases} \frac{1}{2\pi} & 0 \le x \le 2\pi \\ 0 & \text{otherwise} \end{cases}$$

Calculate:

i) Mean Value

ii) Mean Square Value

iii) Variance

iv) Standard Deviation

b) A coin is torsed three times. Write the sample space which gives all possible outcomes. Random variable X, Represents the number of heads on any trippletors. **[8]**

Calculate and draw CDF and PDF.