

[5925]-216

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

SIGNALS AND SYSTEMS

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

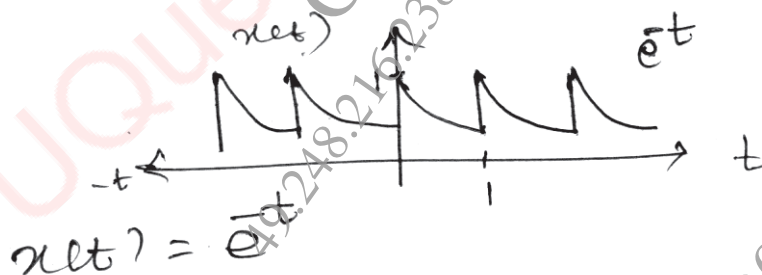
- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Use of logarithmic tables, slide - rule, Mollier charts, electronic pocket calculator steam tables is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) What is Fourier series. Write formula for exponential and Trigonometric Fourier series. [6]

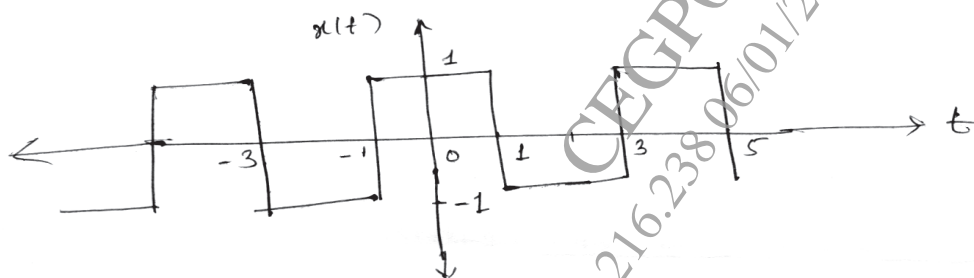
b) State and explain following properties. [6]

- i) Time reversal
- ii) Time Differentiation
- iii) Convolution

c) Determine the FS representation for the signal with periodic wave, shown below using exponential method. [6]



Q2) a) Find the trigonometric Fourier series for the periodic signal $x(t)$ given below. [8]



P.T.O.

- b) State the following properties of CTFS. [6]
- Time scaling
 - Time Integration
 - Modulation
- c) Explain Gibb's phenomenon of Fourier series. [4]

Q3) a) Find the Inverse Fourier Transform using partial fraction expansion. [7]

$$X(j\omega) = \frac{1}{(j\omega)^2 + 5j\omega + 6}$$

- b) Find the Fourier Transform of a constant signal AO. [6]
- c) Find the Fourier Transform of a [4]
- $x(t) = \delta(t) + u(t)$
 - $x(t) = u(-t)$

Using properties of F.T.

- Q4)** a) State any six properties of Fourier Transform. [6]
- b) Find the Fourier Transform of the signum function. [7]
- c) Obtain the Inverse Fourier Transform of [4]

$$X(j\omega) = \frac{2}{j\omega + 1} + \frac{1}{j\omega + 2}$$

Q5) a) Find the Laplace Transform and find ROC. [6]

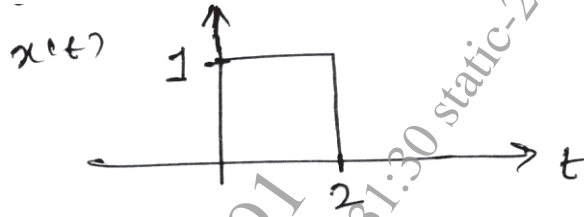
$$x(t) = e^{-3t}u(t) + e^{-2t}u(t)$$

- b) State and explain Initial value theorem and final value theorem. [6]

- c) Find the Inverse Laplace Transform of $X(s) = \frac{2}{(s+4)(s-1)}$ if the ROC is $-4 \leq \text{Re}(s) < 1$. [6]

OR

Q6) a) Find the Laplace Transform of the signal drawn below Find ROC. [6]



b) Solve the differential equation $\frac{dy(t)}{dt} + 3y(t) = x(t)$ for input $x(t) = e^{-2t}u(t)$. Assume zero initial conditions. [6]

c) Find the Laplace Transform of following using the properties. [6]

i) $x(t) = \frac{d}{dt}u(t)$

ii) $x(t) = u(t+1)$

Q7) a) Define the following terms: [6]

- i) Probability
- ii) Joint Probability
- iii) Conditional probability

b) A coin is tossed three times. Write the sample space which gives all possible out comes. A random variable X. Which represents the number of heads obtained on any tripple toss. Calculate and draw the CDF and PDF. [7]

c) In a pack of cards, 2cards are drawn simultaneously. What is the probability of getting a Queen and Jack combination. [4]

OR

Q8) a) Define probability. Also write the properties of probability. [5]

b) A perfect die is thrown. Find the probability that [6]

- i) You get even number
- ii) You get perfect square

c) The probability density function of a random variable 'X' is given by

$$f_x(x) = \begin{cases} \frac{1}{a} & |x| \leq a \\ 0 & \text{otherwise} \end{cases} \quad [6]$$

Determine :
i) Mean
ii) Mean square
iii) Standard deviation

