

[6002]-116

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

SIGNALS & SYSTEMS

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

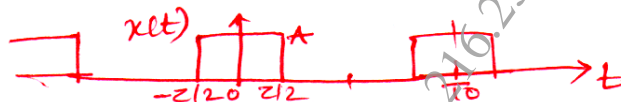
- Q1) a) State the Dirichlet conditions for the existence of Fourier Series. [4]
- b) Find the Trigonometric Fourier Series for the periodic bidirectional symmetric square waveform below. Plot phase and magnitude response. [8]



- c) State and explain the physical significance for following properties for CT signals. [6]
- i) Time Differentiation
 - ii) Convolution
 - iii) Modulation

OR

- Q2) a) Define Fourier series, write equations for Fourier series representation. Compare it. [6]
- b) Determine the complex exponential Fourier Series for periodic Rectangular pulse train shown below. Plot its magnitude and phase spectrum. [8]



- c) State and explain Gibb's Phenomenon. [4]

P.T.O.

Q3) a) What are the limitations of Fourier series. Compare it with Fourier Transform. Write the expression for Fourier Transform for CT Signals. [5]

b) Find the Fourier transform of the signal $x(t) = e^{-3t}u(t)$. Also sketch magnitude and phase response. [6]

c) State the following properties of CTFT. [6]

i) Linearity

ii) Convolution

iii) Time Reversal

OR

Q4) a) Find the Fourier Transform of sine wave signal and sketch magnitude response and phase response. [6]

b) Find the Inverse Fourier Transform using partial fraction expansion. [6]

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

c) Find the Fourier Transform of $x(t) = \cos(\omega_0 t)u(t)$ using the property. [5]

Q5) a) Define convolution property of Laplace Transform and using same property, determine Laplace Transform of following $y(t)$. [6]

$$y(t) = x_1(t) * x_2(t) \text{ where}$$

$$x_1(t) = e^{-2t} \cdot u(t)$$

$$x_2(t) = e^{-3t} \cdot u(t)$$

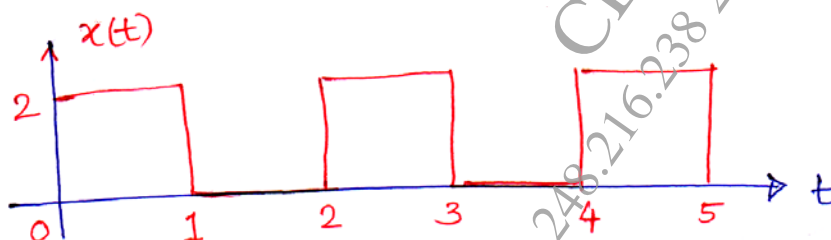
b) State the limitations of Fourier Transform and need of Laplace transform. Compare both. [6]

c) Find the initial and final value of given function [6]

$$X(S) = \frac{S + 4}{S^2 + 3S + 2}$$

OR

Q6) a) Find Laplace Transform of following signal. [6]



- b) Find the inverse Laplace Transform [6]

$$X(S) = \frac{S}{S^2 + 5S + 6}$$

- c) A signal has Laplace transform [6]

$$X(S) = \frac{S+2}{S^2 + 4S + 5}$$

Find Laplace transform $Y(S)$ if

- i) $y(t) = t \cdot x(t)$
- ii) $y(t) = e^{-t} \cdot x(t)$

- Q7) a) Write short note on the following : [6]

- i) Random experiment
- ii) Random event
- iii) Sample space
- iv) Random variable
- v) Probability of certain event is _____
- vi) If A and B are mutually exclusive events then $P(A + B) =$ _____

- b) A certain computer becomes in operative, if two components A and B both are fails. The probability that A fails is 0.01 and the probability that B fails is 0.05. However the probability B fails increase by factor 4, if A has failed. Calculate the probability that the computer becomes inoperable. Also find the probability that A will fail if B has failed. [5]

- c) Define CDF and state any four properties of CDF. [6]

OR

- Q8) a) Define PDF and state four properties of PDF. [6]

- b) Find mean, second moment and standard deviation of x [6]

$$f_x(x) = A \cdot e^{-Ax} u(x)$$

- c) In a random experiment of rolling a dice Find the probability of [5]

- i) Getting a number 3 or 4
- ii) Getting a number less than 5
- iii) Getting a number between 3 and 6

