Total No. of Questions : 8]

SEAT No. : ____

PF-4733

[Total No. of Pages : 3

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S.E. (E & T.C/Electronics / E & Computers)

SIGNALS & SYSTEMS

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

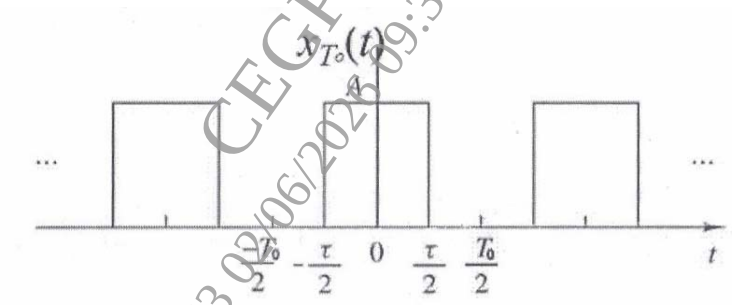
Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q.5 or Q.6, Q.7 or Q,8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) State Dirichlet conditions for existence of Fourier Series. **[4]**

b) Find the trigonometric Fourier series for the following signal as shown in fig. & draw the magnitude and phase spectrum. **[8]**



c) State and explain the following properties of Fourier Series. **[6]**

i) Linearity ii) Time scaling

OR

Q2) a) State and explain the following properties of Fourier Series. **[6]**

i) Convolution ii) Time shifting

b) Find exponential Fourier series for unit impulse train given below & draw the spectrum. **[8]**

$$x(t) = \sum_{k=-\infty}^{\infty} \delta(t - KT_0)$$

c) Explain the following terms **[4]**

i) Gibb's Phenomenon. ii) Orthogonality

P.T.O.

Q3) a) Find Fourier Transform of the following signals **[5]**

i) sgn(t) ii) u(t)

b) Find Fourier Transform of sinc function and plot its magnitude & phase Spectrum x(t) =sinc(t). **[6]**

c) State and prove the following properties of Fourier transform. **[6]**

i) Modulation

ii) Time Differentiation.

OR

Q4) a) Find Fourier Transform of following rectangular Pulse and plot its magnitude & phase Spectrum x(t) = rect (t). **[6]**

b) State and prove the following properties of Fourier transform: **[6]**

i) Integration in time domain

ii) Frequency shifting

c) Find Fourier Transform of the following using properties: **[5]**

x(t) = 10 rect [(t-3)/2]

Q5) a) Find the Laplace Transform of the following signal and draw the ROC i. e^{5t} .u(t). **[6]**

b) State and prove the property of Laplace Transform. **[6]**

i) Differentiation in time domain

ii) Time shifting

c) Find the initial value and final value of x(t) given: **[5]**

$X(s) = (2s + 3)/(s^2 + 5s - 7)$

OR

Q6) a) Define ROC, and explain the properties of ROC. **[6]**

b) Determine Laplace Transform and sketch its ROC: **[6]**

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

ii) $x(t) = \sin(3t) . u(t)$

c) Find inverse Laplace transform of the following given X(s): **[5]**

$$X(s) = \frac{-5s - 7}{(s+1)(s-1)(s+2)}$$

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Q7) a) Explain the following terms : **[6]**

i) Mean

ii) Variance

iii) Standard deviation

b) A random variable X is defined by CDF.

$$F_x(x) = \begin{cases} 0 & x < 0 \\ x/2 & 0 \le x \le 1 \\ k & x \ge 1 \end{cases}$$ **[8]**

i) Find the value of k.

ii) What is the probability $p\left(\frac{1}{2} < x \le 1\right)$.

iii) Find the PDF

iv) p(x > 2)

c) Two cards are drawn simultaneously (or successively without replacement) from a well shuffled pack of 52 cards. Find the probability of **[4]**

i) Combination of king & queen

ii) Both will be heart

OR

Q8) a) A box contains 3 white, 4 red & 5 black balls. A ball is drawn at random. Find the probability that it is **[6]**

i) Red

ii) Not Balck

iii) Black or white

b) If the probability distribution function of random variable is given by **[6]**

$f_x(x) = (1 - x)^2$ for $0 \le x \le 1$

Then find mean, variance & stabdard deviation.

c) State & Explain the properties of CDF & PDF. **[6]**

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