Sr. No.....

May 2019

B.Tech. – IV SEMESTER

Signal and Systems (EI204C)

Time: 3 Hours

Max. Marks:75

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART –A

Q1 (a) Define the following i) exponential and sinusoidal signals ii) unit impulse signal. (1.5)

(b) Distinguish between continuous time and discrete time signals. (1.5)

(c) Invent whether the given system described by the equation is linear and time invariant $y(n)=n[x(n)]^2$ (1.5)

(d) Write the synthesis and analysis equation of continuous time Fourier Transform. (1.5)

(e) State and prove time shifting property of DTFT. (1.5)

(f) What is the purpose of filtering in analysis of signal and system? (1.5)

(g) What is the need of Laplace transform? (1.5)

(h) Distinguish between DFT and DTFT. (1.5)

(i) What are different types of fourier series representation? (1.5)

(j) Find the initial and final values for the following transform $\frac{s+5}{s^2+3s+2}$ (1.5)

PART –B

Q2 (a) Explain different types of continuous and discrete time LTI systems. (10)

(b) For each given impulse response h(n) = $2^n u(-n)$ and h(n)= $sin\frac{n\pi}{2}$,determine whether the corresponding system is i) causal ii) stable (5)

Q3 (a) State and prove convolution property of continuous time fourier transform. Find the fourier transform of the periodic signal x(t) as shown in given fig.1 (8)

$$x(t) = \begin{cases} A, & |t| < \frac{a}{2} \\ 0, & |t| > \frac{a}{2} \end{cases}$$

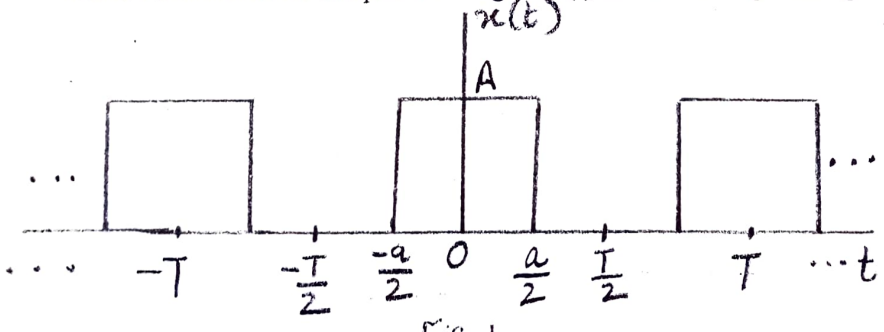

Fig. 1

(b) Determine and sketch the magnitude and phase response of the LTI causal system described by the differential equation (7)

$$\frac{dy(t)}{dt} + y(t) = \frac{dx(t)}{dt} - x(t)$$

PTO

Q4 (a) Find the trigonometric Fourier series for the square wave as shown in fig.2 (8)

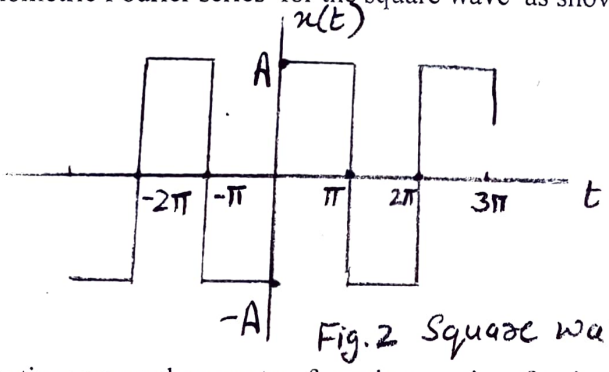

Fig.2 Square wave

(b) State and prove time reversal property of continuous time fourier series. Determine the fourier series coefficients of the signal x(n) (7)

$$x(n) = 1 + \sin\left(\frac{2\pi}{N} n\right) + 3\cos\left(\frac{2\pi}{N} n\right) + \cos\left(\frac{4\pi}{N} n + \frac{\pi}{2}\right)$$

Q5 (a) Determine (a) Linear convolution (b) circular convolution of two sequences $x_1(n) = \{1,1,2,2\}$ and $x_2(n) = \{1,2,3,4\}$. Also find circular convolution using the DFT and IDFT. (10)

(b) State multiplication property. Find the DTFT of $x(n) = \cos\frac{\pi n}{2}\, u(n)$ (5)

Q6 (a) Realize cascade and parallel structure of $H(s) = \frac{s+3}{s^2+7s+10}$ (8)

(b) Determine the Laplace transform and the associated ROC of the following function of time $x(t) = e^{-4t}u(t) + e^{-5t}\sin(5t)\,u(t)$. (7)

Q7 (a) Discuss the properties of LTI system. Also find the impulse response for the LTI system characterized by the difference equation (10)

$$y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) - \frac{1}{2}x(n-1)$$

(b) Describe response of LTI system to complex exponential. (5)

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