

Roll No.:

National Institute of Technology Delhi

Name of the Examination: B.Tech.

Branch: ECE, CSE, EEE
 Course Title: Signals and Systems
 Time: 2 Hours

Semester: 3rd
 Course Code: ECB 204
 Maximum Marks: 25

Note:

- Answers should be CLEAR, TO THE POINT AND LEGIBLE.
- Q.1 to Q.3 are 3 marks each and Q.4 to Q.7 are 4 marks each, if the question is divided in to parts then marks are equally divided into all parts.

Q. 1. Determine all the values of independent variable (n) at which even part of the signal $x[n]$ is guaranteed to be zero.

$$x[n] = \left(\frac{1}{3}\right)^n u[2n+4]$$

Q. 2. Determine whether or not the signal $x[n]$ is periodic. If the signal is periodic, determine its fundamental period.

$$x[n] = \cos\left(\frac{3n\pi}{5}\right) + \cos\left(\frac{7n\pi}{9}\right)$$

Q. 3. For a given discrete time LTI system Fig.1. Determine whether the system is causal and/or stable.

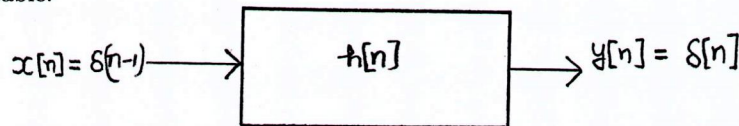


Fig.1

Q. 4. Suppose that the input signal

$$x(t) = u(t+0.5) - u(t-0.5)$$

and impulse response of the LTI system is

$$h(t) = e^{j\omega_0 t}$$

Determine all values of ω_0 which ensures that output signal $y(0) = 0$.

Q. 5. Determine the continuous time signal $x(t)$ if the Fourier series coefficients a_k of the signal are given as

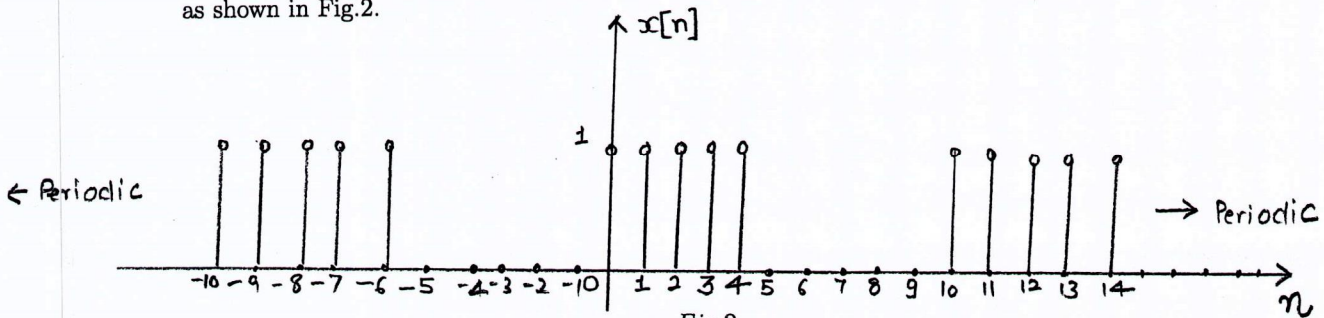
$$a_k = \begin{cases} 1 & \text{for even values of } k. \\ 2 & \text{for odd values of } k. \end{cases}$$

Q. 6. Let $x_1(t)$ be a continuous time periodic signal with fundamental frequency ω_1 and Fourier series coefficients a_k , Given that

$$x_2(t) = x_1(-3t - 1)$$

How is the fundamental frequency ω_2 of $x_2(t)$ related to ω_1 ? Also find Fourier series coefficients b_k of $x_2(t)$ as a function of coefficients a_k .

Q. 7. Find the discrete time Fourier series coefficients for the discrete time periodic signal $x[n]$ as shown in Fig.2.



End of Question Paper