

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:

1. Answers should be CLEAR, TO THE POINT AND LEGIBLE.
 2. All parts of a single question must be answered together and in the same sequence as given in question paper. ELSE QUESTION SHALL NOT BE EVALUATED.
 3. 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.
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Q. 1. Find even and odd part of signal $x(t) = e^{jt}$.

Q. 2 a. Determine whether or not the signal $x(t)$ is periodic. If the signal is periodic, determine its fundamental period.

$$x(t) = \cos t + \sin \sqrt{2}t$$

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

$$x[n] = e^{j(\frac{\pi n}{4})}$$

Q. 3. Determine the value of E_∞ and P_∞ for the given signal $x[n]$ and check whether the signal is energy or power or neither of both.

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

Q. 4. Find the output $y[n]$ of a LTI system for the given input $x[n]$ and impulse response $h[n]$.

$$x[n] = \alpha^n u[n-2]$$

and

$$h[n] = u[n]$$

Given that $0 < \alpha < 1$.

Q. 5. The system shown in Fig.1 is formed by connecting two systems in cascade. The impulse responses of the system are given by $h_1(t)$ and $h_2(t)$, respectively, and

$$h_1(t) = e^{-2t}u(t) \quad \text{and} \quad h_2(t) = 2e^{-t}u(t)$$

- Find the impulse response $h(t)$ of the overall system.
- Determine if the overall system is BIBO stable.

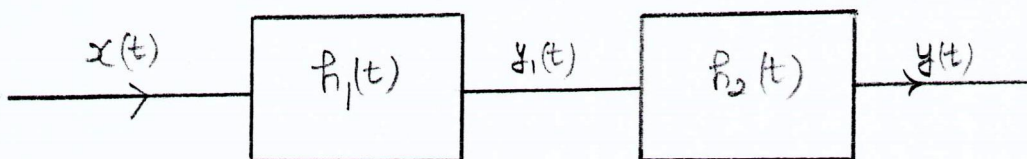


Fig.1

Q. 6. Find the continuous time Fourier series coefficients of a periodic signal $x(t)$ as shown in Fig.2. Signal $x(t)$ is periodic with Period $T=8$.

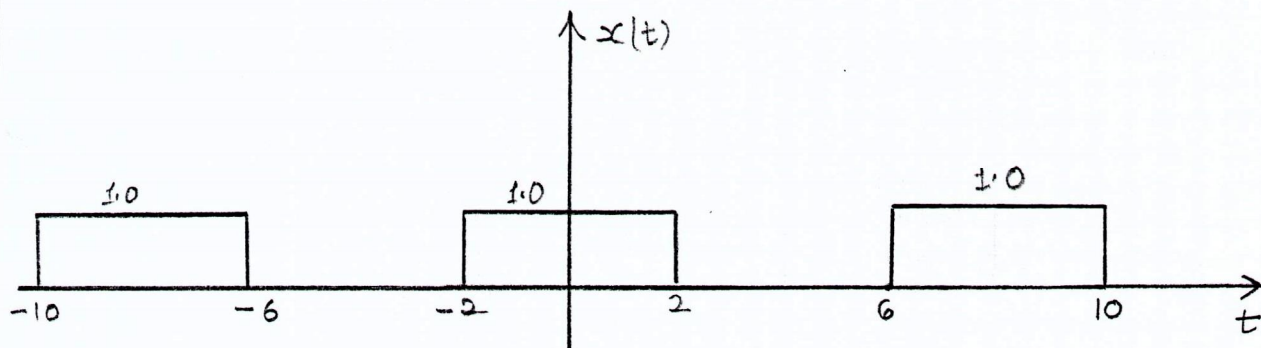


Fig.2

Q. 7. Consider a discrete time LTI system with impulse response

$$h[n] = \begin{cases} \left(\frac{1}{2}\right)^{|n|} & \text{for } n = -1, 0, 1. \\ 0 & \text{otherwise.} \end{cases}$$

Find the Discrete time Fourier series representation of the output $y[n]$ if input $x[n] = \sum_{k=-\infty}^{\infty} \delta[n - 4k]$ is given to the LTI system.

End of Question Paper