

*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

Qu-1: Briefly explain the significance of Fourier series for the analysis of signals?

[3, CO-3]

Qu-2: What do mean by the convolution? For a given system, give the relationship between input  $x(t)$  and out  $y(t)$  with help of convolution.

Also, illustrate the concept of convolution in a graphical way?

[2+2+1=5, CO-2]

Q-3 A system has been applied the input is  $x(t) = \exp(st)$ . Use the following relationship:

$$y(t) = \int_{-\infty}^{\infty} x(t - \tau) \cdot h(\tau) d\tau$$

and find the Eigen value corresponding to the given  $x(t)$ .

Q-4 In case of Fourier series, what do you mean by the line spectrum?

[3, CO-3]

Draw the complete spectrum when following inputs signal  $x(t)$  is applied for a given system:

$$x(t) = \cos 2\omega t + \sin \omega t$$

[4, CO-3]

Q-5 Calculate the coefficients  $a_k$  for the continuous-time periodic signal

$$x(t) = \begin{cases} -1, & 0 \leq t < 1 \\ 1, & 1 \leq t < 2 \end{cases}$$

assume that the fundamental frequency is  $\omega_0 = \pi$

[4, CO-3]

Q-6 Attempt all the three parts.

Verify, whether following systems is stable or not. When

a) A system is defined by the following relationship:

$$y(n) = \frac{1}{2M+1} \sum_{k=-M}^M x(n-k) \quad \text{where } x(n-k) \leq L \quad \text{if all } x(n-k) = L$$

b)  $y(t) = \int_{-\infty}^{3t} x(\tau) d\tau$ ; system is defined by this equation, where  $x(t) = u(t)$

c)  $x(t) = u(t) - u(t-1)$  and  $y(t) = e^{-t}u(t)$  are given as system input and output respectively.

[2+2+2=6, CO-2]