

DECEMBER 2006

Code: A-06/C-04/T-04

Subject: SIGNALS & SYSTEMS

Time: 3 Hours

Max. Marks: 100

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or best alternative in the following: (2x10)

(A)

(B)

(C)

(D)

$$\frac{d^2 y}{dt^2} + y(t) = x(t)$$

(A)

(B)

(C)

(D)

$$\frac{\sin(\pi u)}{(\pi u)}$$

(A) sinc (πu)

(B)

(C)

(D)

$$h(n) = \delta(n) - \delta(n-1)$$

(A) $\delta(\omega) - \delta(\omega-1)$ (B) $1 - e^{j\omega}$ (C) $u(\omega) - u(\omega-1)$ (D) $1 - e^{-j\omega}$

(A)

(B)

(C)

(D)

(A)

(B)

(C)

(D)

(A)

(B)

(C)

(D)

(A)

(B)

(C)

(D)

(A) $\frac{1}{j2\pi f}$

(B) $j2\pi f$

(C) $\frac{1}{1+j2\pi f}$

(D)

$$f_X(x) = 5e^{-Kx} u(x)$$

 $u(x)$

(A) $\frac{1}{5}$

(B) $\frac{1}{25}$

(C)

(D)

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

Q.2

 $(T = 2\pi)$

$$x(t) = 4 + 2 \cos 3t + 3 \sin 4t$$

(8)

$$x(t) = \sqrt{2} \cos\left(\omega t + \frac{\pi}{4}\right)$$

$$y(n) = x(3n - 2) \quad x(n) = \begin{cases} 1, & -2 \leq n \leq 2 \\ 0, & |n| > 2 \end{cases} \quad (4+4)$$

Q.3

(8)

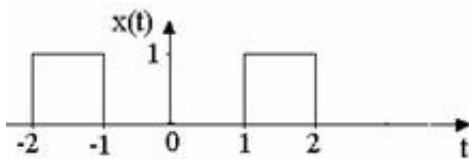


Fig.1

$$x(n) * \delta(n - 2)$$

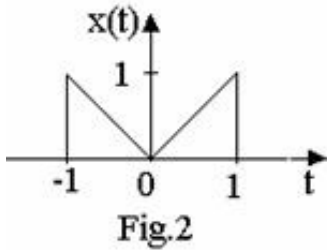
$$x(n) = \delta(n + 2) + 2\delta(n) + 3\delta(n - 2)$$

$$h(n) = u(n) - u(-n - 1)$$

(4+4)

Q.4

(8)



$$x(t) = \sin(\pi t) \cdot e^{-2t} u(t)$$

(4+4)

Q.5

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

$$h(n) \xleftrightarrow{\text{DTFT}} H(\Omega) = \begin{cases} 1, & |\Omega| \leq \frac{\pi}{4} \\ 0, & \text{otherwise} \end{cases} \quad 2\pi$$

(12)

$$x^*(n) \xleftrightarrow{\text{DTFT}} X^*(-\Omega) \quad x(n) \xleftrightarrow{\text{DTFT}} X(\Omega)$$

(4)

Q.6

$$y(n) - \frac{1}{4}y(n-2) = x(n-1) \quad (8)$$

$$x(n) = \{1, 2, 3, 2, 1\}$$

$$\uparrow$$

$$n=0$$

$$h(t) = e^{-9t} u(t)$$

$$\Omega = 0$$

$$h(n) = 9\delta(n-1)$$

(4+4)

y(t)

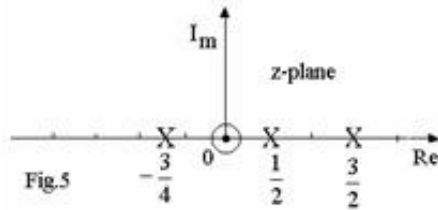
Q.7

$$\frac{d^2 y(t)}{dt^2} + 4 \frac{dy(t)}{dt} + 3y(t) = e^{-t}; \quad y(0^+) = 1 = \left. \frac{dy(t)}{dt} \right|_{t=0^+}$$

(12)

$$\frac{e^{-at} - e^{-bt}}{t} \stackrel{\mathcal{L}}{\leftrightarrow} \log\left(\frac{s+b}{s+a}\right) \tag{4}$$

Q.8



$$x(n) \stackrel{z}{\leftrightarrow} X(z) \qquad x(n) \stackrel{z}{\leftrightarrow} -z \frac{dX(z)}{dz}$$

$$x(t) = \cos(5\pi t) + 0.5 \cos(10\pi t)$$

$x_s(t)$ T T $x_s(t)$

(4+4)

Q.9

(8)

$$S_X(s/j) = \frac{c(s)c(-s)}{d(s)d(-s)} \tag{8}$$

$$S_X(\omega) = \frac{25\omega^2}{\omega^4 + 10\omega^2 + 9}$$