Sardar Vallabhbhai National Institute of Technology, Surat

Electronics Engineering Department

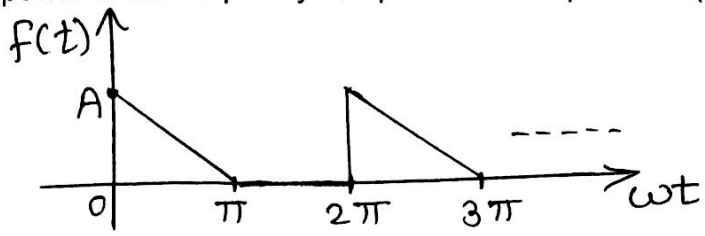
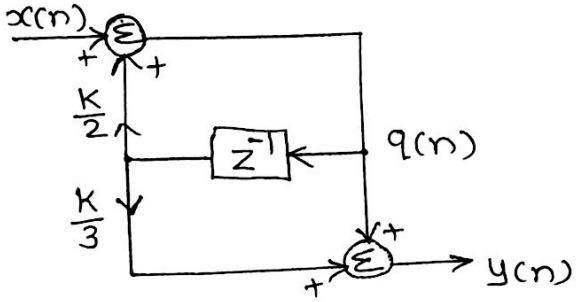
B.Tech II EC (MIDSEM - Exam)

Signals & Systems

*Assume necessary data if required

Marks : **30**
Time: **1 Hour**

Q.1	**Do as Directed** 1. Verify whether the signal is causal-Non Causal, Linear-Non linear, ~~Static-Dynamic~~, Energy-Power and Periodic-Non-periodic. (even-odd) a. $x(n) = e^{j(\frac{\pi}{2}n+\frac{\pi}{4})}$ b. $x(n) = \cos(\omega_0 n) \cdot u(n)$ 2. Check the linearity for **y(n) = median { x(n) }.**	4 1
Q.2	a) Explain significance of Sampling. How Band Pass Signals are Sampled. Draw the necessary diagrams. b) Find the Nyquist Rate and Sampling Period for the given Signal $x(t) = \sin c(100 \cdot \pi \cdot t) + 3\sin c^2(60 \cdot \pi \cdot t)$	4
Q.3	a) Determine the response of the relaxed system using convolution sum method which is characterized by the impulse response $h(n) = u(n-3)$ to the input signal $x(n) = 2^n \cdot u(-n+2)$ b) Find the convolution of the signals using graphical method. $x(n) = \begin{cases} 1, & n = -2 \text{ to } 1 \\ -1, & n = 2 \\ 0, & \text{elsewhere} \end{cases}$ $h(n) = \delta(n) - \delta(n-1) + \delta(n-2) - \delta(n-3)$	6

Q.4	Determine the magnitudes of the first 3 harmonics of the signal shown below. Also determine power of the frequency component corresponds to (2ωt).  	5
Q.5 (A)	Consider the discrete time system shown below. For what values of K the system is stable and causal .  **OR**	4
(B)	Two filters are described by $y(n) - 0.4y(n-1) = x(n)$ and $h_2(n) = 2(0.4)^2u(n)$ are connected in series. Find out impulse response of overall system. (note: Use PFE method)	
Q.6 A)	If X(Z) is the z-transform of $x(n) = (1/2)^{\|n\|}$, then what is the ROC of X(Z) ?	6
B)	Determine z-transform and ROC of : $x(n) = (1/4)^n u(-n)$	
C)	The z-transform X(Z) of a sequence x(n) has two poles at $Z = e^{+ - (j\pi/2)}$ and two zeros at origin. If X(1) = 1,which one of the following is true? Give reason. (1) $X(Z) = 2Z^2/((Z-1)^2+2)$ ROC is $1/2 < \|Z\| < 1$ (2) $X(Z) = 2Z^2/(Z^2+1)$ ROC is $1/2 < \|Z\|$ (3) $X(Z) = 2Z^2/((Z-1)^2+2)$ ROC is $\|Z\| > 1$ (4) $X(Z) = 2Z^2/(Z^2+1)$ ROC is $\|Z\| > 1$	