

ET0096 MST SAMPLEANSWERS:

A1 d

A2 a

A3 c

A4 a

A5 c

A6 b

A7 d

A8 b

A9 b

A10 a

B1a)

Quantizer:

To convert each sample of the signals into a binary codeword. In other words, it converts the continuous-amplitude signal to a discrete-amplitude signal and encodes the samples into binary codewords.

Reconstruction filter:

This is usually a low pass filter used to smoothen the output signal such that it becomes continuous-amplitude.

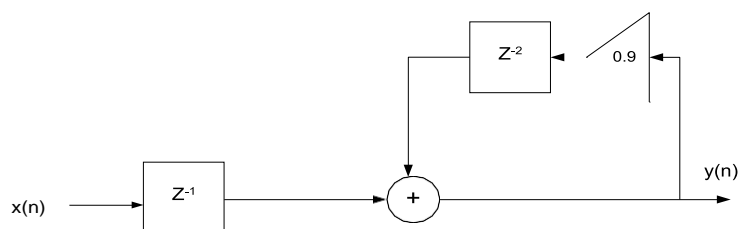
i) $x(0)=1.0000$ $x(1)=3.1743$

ii) $x(t) = \cos(1000\pi t) + 2\sin(2500\pi t) + \sin(3000\pi t)$

iii) 1.5 kHz

B2) a) $y = \{0 \quad 1.0000 \quad 0 \quad 0.9000\}$

b) $y(n) = 0.9 y(n-2) + x(n-1)$

c) Stable, as n increases, $y(n)$ seems to decreaseB3)

a) $x(n) = \{1, 2, 3, 4, 5, 6, 7\}$

$$x(n-2) = \{0, 0, 1, 2, 3, 4, 5, 6, 7\}$$

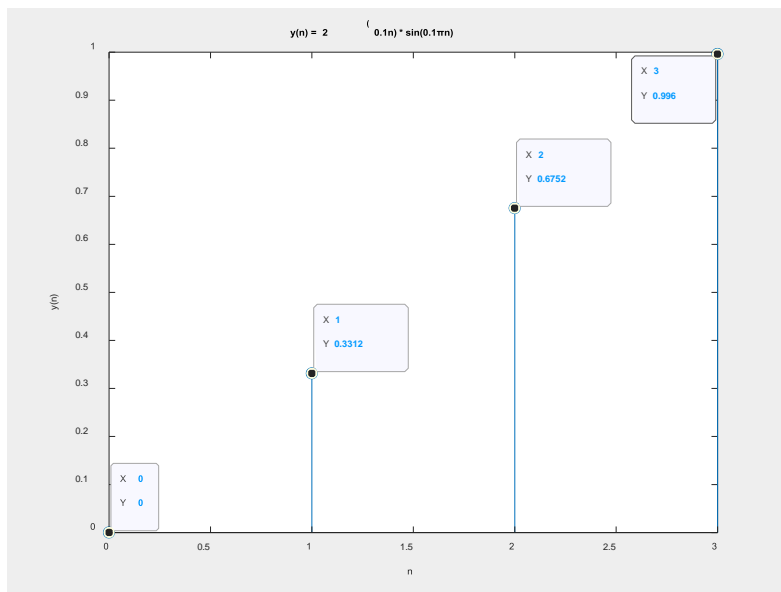
$$x(3n) = \{1, 4, 7\}$$

$$x_1(n) = 2x(n-2) + x(n) \text{ and } x_2(n) = x(3n) + x(n-2)$$

$$x_1(n) = \{1 \quad 2 \quad 5 \quad 8 \quad 11 \quad 14 \quad 17 \quad 12 \quad 14\}$$

$$x_2(n) = \{1 \quad 4 \quad 8 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7\}$$

b) $y(n) = \{0 \quad 0.3312 \quad 0.6752 \quad 0.9960\}$



$$y_1 = \{0 \quad 0.3312 \quad 0.6752 \quad 0.9960\}$$

B4) $x_1(n) = \delta(n) + 2\delta(n-1) + 3\delta(n-2) = \{1 \ 2 \ 3\}$

$$x_2(n) = u(n) - u(n-2) = \{1 \ 1\}$$

a) $x_1(n) * x_2(n) = \{1 \quad 3 \quad 5 \quad 3\}$

b) $y(n) = \{1 \quad 3 \quad 5 \quad 3\}$

c) Autocorrelation of $x_1(n) = \{3 \quad 8 \quad 14 \quad 8 \quad 3\}$