

QP Code : 30057

(3 Hours)

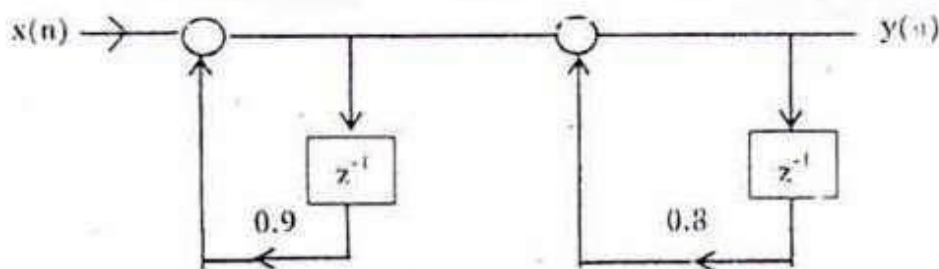
[Total Marks : 80

- N.B.:** (1) Attempt any **four** questions
 (2) Assume suitable data wherever necessary, justify the same
 (3) Figures to the **right** indicate **full marks**

1. a. Explain in brief real time DSP system. 5
 b. Explain sampling rate conversion by non-integer factors 5
 c. Explain very long instruction word (VLIW) architecture used for P-DSPs. 5
 d. Explain how power spectral density of a given 5 volts and 1000Hz sinusoidal discrete time sequence of 1024 data points, sampled at 5000Hz is calculated using FFT. 5

- a. Compute 8-point DFT of sequence $x(n) = \{1, 2, 3, 4, 1, 2, 3, 4\}$ using DIF-FFT algorithm 10
 b. A cascade realisation of the two first order digital filter is shown below. The system functions of the individual sections are 10

$$H_1(z) = \frac{1}{1 - 0.9z^{-1}} \text{ and } H_2(z) = \frac{1}{1 - 0.8z^{-1}}$$



Draw product quantisation noise model of the system and determine the overall output noise power.

3. a. Design a band pass FIR filter for the following specifications 10
 Cutoff frequencies = 400 Hz to 800 Hz
 Sampling frequency = 2000Hz
 Filter length = 11
 Use rectangular window
 b. Design IIR digital Butterworth filter to satisfy the constraints 10
 $0.707 \leq |H(e^{j\omega})| \leq 1$ $0 \leq \omega \leq 0.5\pi$ and
 $|H(e^{j\omega})| \leq 0.2$ $0.75\pi \leq \omega \leq \pi$
 With $T = 1$ sec. Apply Bilinear transformation.

4. a. Implement a two stage decimator for the following specifications 12
- Sampling Frequency = 20KHz
 Decimation factor 'D' = 100
 Passband = 0 Hz to 40 Hz
 Transitionband = 40 Hz to 50 Hz
 Passband ripple = 0.02
 Stopband ripple = 0.002

- b. The spectrum of discrete time signal is as shown in figure B. Sketch the spectrum of 8

i)

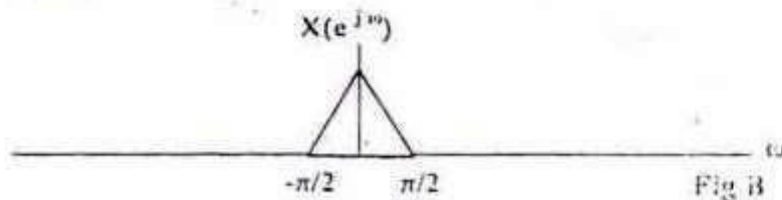


Fig B

- a. Define periodogram and explain how DFT and FFT are useful in power spectral estimation 6
- b. What are limitation of non-parametric methods in spectral estimation 6
- c. Discuss power spectrum estimation using Welch method 8
6. Write short notes on any Four 20
- i) Audio applications of DSP
 - ii) Telecommunication applications of DSP
 - iii) Biomedical applications of DSP
 - iv) General purpose digital signal processors
 - v) Polyphase implementation of Decimator and Interpolator
 - vi) Effect of finite word length in digital filters