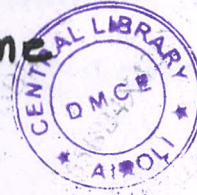


TE(ELEX.) / Sem-II / R-19 / 'C' Scheme



Duration: 3hrs

[Max Marks:80]

N.B. : (1) Question No 1 is Compulsory.

(2) Attempt any three questions out of the remaining five.

(3) All questions carry equal marks.

(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
 - a Compute IDFT for the given DFT $X(k) = \{2, 1+j, 0, 1-j\}$
 - b State and prove the circular time shift property of discrete time signal.
 - c Explain Decimation and Interpolation.
 - d Convert the following analog filter with system function $H(s) = \frac{1}{(s+2)(s+0.6)}$ into a digital filter by means of impulse invariant and BLT method.
 - e Compute the circular convolution of following discrete time signals $x_1(n) = \{1, 3, 5, 3\}$ and $x_2(n) = \{2, 3, 1, 1\}$
- 2 a Using DFT/IDFT method, find the response of the system with impulse response $h(n) = 5\delta(n) - 2\delta(n-1)$ if the input to the system is $x(n) = 3u(n) - 2u(n-2) - u(n-3)$ [10]
 - b Design a Butterworth digital IIR lowpass filter using Impulse Invariant transformation method for the following specifications. [10]

$$0.707 \leq |H(e^{j\omega})| \leq 1.0 \text{ for } 0 \leq \omega \leq 0.3\pi$$

$$|H(e^{j\omega})| \leq 0.2 \text{ for } 0.75 \leq \omega \leq \pi, (T=1\text{sec})$$
- 3 a Draw architectural block diagram of DSP processor and explain functions of each block. [10]
 - b Design a lowpass FIR filter using Hamming window to meet the following specifications [10]

$$H_d(\omega) = 1 \quad \pi/6 \leq \omega \leq \pi/6$$

$$= 0 \quad \text{Otherwise}$$
 Use 10 tap filter and obtain impulse response of desired filter.
- 4 a Obtain the DFT of the sequence $x(n) = (\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0)$ using DIF FFT algorithm. [10]
 - b Describe any one application of DSP. [10]
- 5 a Find linear convolution using overlap-save method the following sequences: [10]

$$x[n] = \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\}$$
 and $h[n] = \{1, 2, 3\}$
 - b Determine impulse response $h(n)$ of a filter having desired frequency response, [10]

$$H_d(e^{j\omega}) = e^{-j(M-1)\omega/2} \quad 0 \leq \omega \leq \pi/2$$

$$= 0 \quad \pi/2 \leq \omega \leq \pi, M=7, \text{ Use frequency sampling approach.}$$
- 6 a A difference equation describing a filter is given below [10]

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n] + \frac{1}{2}x[n-1]$$
 Draw direct form-I and direct form-II realizations.
 - b Write a note on polyphase filters. [10]

QP code: 83377

Prog. code: 1T01135

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