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BT–5/D-21 **45246**

DIGITAL SIGNAL PROCESSING

Paper–EC-309A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. Compare the convolution x(n) of the signals by using convolution property of z-transform :

   $x_1(n) = \{1, -1, 1\}$

   $x_2(n) = 1, \quad 0 \le n \le 5$

   $0, \quad$ elsewhere. 15

2. Use the four point DFT and IDFT to determine the sequence x(n) which is convolution of $x_1(n)$ and $x_2(n)$.

   $x_1(n) = \{1, 2, 2, 1\}$ $x_2(n) = \{3, 3, 2, 1\}$. 15

UNIT–II

3. Determine the cascade form realization for the system :

$$H(z) = \frac{10\left(1-1/2z^{-1}\right)\left(1-2/3z^{-1}\right)\left(1+2z^{-1}\right)}{\left(1-3/4z^{-1}\right)\left(1-1/8z^{-1}\right)\left(1-z^{-1}+1/2z^{-2}\right)}.$$ 15

4. Describe radix 2 and radix 4 FFT. 15

UNIT–III

5. Design an FIR linear phase digital filter approximating the ideal frequency response :

   $H_d(w) = 1$ for $|w| \le \pi/6$

   0 for $\pi/6 \le |w| \le \pi$

   Determine the coefficient for Blackman window. Consider M = 15. 15

6. Discuss in detail various window methods of FIR filter design. Differentiate them based on their response in pass band and stop band. 15

UNIT–IV

7. Determine the order and the poles of a low pass Butterworth filter that has a –3 dB bandwidth of 500 Hz and an attenuation of 40 dB at 1000 Hz. 15

8. Determine the order and poles of a type 1 low pass Chebyshev filter that has 1-db ripple in the pass band, a cut off frequency $\Omega_p = 500\pi$, a stop band frequency of 1000π and an attenuation of 40dB or more for $\Omega > \Omega_s$. 15

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