

1078

**B.E. (Electronics and Communication Engineering)**  
**Seventh Semester**  
**EC-709: Digital Signal Processing**

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

1. a. Discuss the circular addressing modes of TMS320C5X processor
- b. Compare FIR and IIR filters.
- c. State and prove the following properties of z-transform.
  - i. Time scaling
  - ii Differentiation
- d. Explain the relation between the z-transform and DFT.
- e. What are the effects of finite word length in digital filters? (5+2)

**Section A**

2. a. Describe time frequency analysis of signals using wavelet transforms. How increasing frequency resolution does decreases time resolution.
- b. Derive the DFT of the sample data sequence  $x(n) = \{1,1\}$  and compute the corresponding amplitude and phase spectrum. (5+5)
3. a. Given  $x(n) = \{0,1,2,3,4,5,6,7\}$ . find  $X(k)$  using DIT FFT algorithm.
- b. Determine the causal signal  $x(n)$  having the z-transform using partial fraction method
 
$$X(z) = \frac{1}{(1+z^{-1})(1-z^{-1})^2} \quad (5+5)$$
4. Find the response of an FIR filter with impulse response  $h(n) = \{1, 2, 4\}$  to the input sequence  $x(n) = \{1, 2\}$  using linear and circular convolution. Compare the results. (10)

**Section B**

5. a. Describe the frequency domain analysis of Decimator. What are the effects of decimation on frequency spectrum of the signal?
- b. Determine  $H(z)$  for a Butterworth filter satisfying following constraints

$$\sqrt{0.5} \leq |H(e^{jw})| \leq 1 \quad 0 \leq w \leq \pi/2$$

$$|H(e^{jw})| \leq 0.2 \quad 3\pi/4 \leq w \leq \pi$$

with  $T = 1s$ . Apply impulse invariant transformation. (5+5)

6. a. Name the different types of window functions. How they are defined?
- b. Obtain the cascade realization of the system characterized by the transfer function

$$H(z) = \frac{2(z+2)}{z(z-0.1)(z+0.5)(z+0.4)} \quad (5+5)$$

7. a. Apply bilinear transformation to  $H(s) = \frac{2}{(s+1)(s+3)}$  with  $T = 0.1s$ .
- b. Discuss the architecture of TMS320CXX series processor and also discuss the memory management block. (5+5)

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