

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)

B.Tech.Sem - VI ELECTRONIC : WINTER- 2022

SUBJECT : DIGITAL SIGNAL PROCESSING

Day : Thursday

Time : 10:00 AM-01:00 PM

Date : 24-11-2022

W-13388-2022

Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Assume suitable data if necessary.

Q.1 Perform the circular convolution of the following sequences using concentric circle method. [10]

$$x(n) = \{3, 2, 4, 1\}, \quad h(n) = \{1, 2, 1, 2\}.$$

OR

State and explain following properties of DFT: [10]

- | | | |
|--------------------------|-----------------|---------------------|
| i) Linearity | ii) Periodicity | iii) Multiplication |
| iv) Circular convolution | | v) Time reversal |

Q.2 Compute 8-point DFT of the following sequence using radix-2 DIT-FFT algorithm: [10]

$$x(n) = \{1, 0, 1, 0, 1, 0, 1, 0\}.$$

OR

Evaluate IDFT of the sequence [10]

$$X(k) = \{4, 1-j2.414, 0, 1-j0.414, 0, 1+j0.414, 0, 1+j2.414\}$$

Q.3 A LPF has the desired frequency response as given below: [10]

$$H_d(e^{j\omega}) = e^{-j3\omega} \quad ; \quad 0 \leq \omega \leq \frac{\pi}{2}$$
$$= 0 \quad ; \quad \frac{\pi}{2} \leq \omega \leq \pi$$

Determine the filter coefficients $h(n)$ for $M = 7$ using frequency sampling method.

OR

a) Explain in detail Gibb's phenomenon. [05]

b) Obtain cascade and direct form realization with minimum number of multipliers. [05]

$$H(z) = (1+z^{-1}) \left(\frac{1}{2} - \frac{1}{4}z^{-1} + \frac{1}{2}z^{-2} \right).$$

P.T.O.

- Q.4** The system function of an analog filter is given by **[10]**
$$H(s) = \frac{s+0.2}{(s+0.2)^2 + 9}$$
. Convert it into digital filter using Impulse Invariance Method. Assume $T_s = 1$ second.

OR

- a)** Show that the bilinear transformation maps $j\omega$ axis in the s-plane onto unit circle in z-plane, and maps the left half of s-plane inside the unit circle in z-plane. **[05]**
- b)** What is frequency warping effect? **[05]**

- Q.5** Explain the method of scaling to prevent overflow limit cycle oscillations. **[10]**

OR

Discuss in detail finite word length effects in FIR filters. **[10]**

- Q.6 a)** Describe the multiplier and accumulator unit in DSP processor. **[05]**
- b)** Explain in detail an application of DSP in speech processing. **[05]**

OR

- a)** What are the differences between fixed and floating point DSP processors? **[05]**
- b)** With suitable example, explain the pipelining concept. **[05]**

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