**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 Differentiate between Bilinear Transformation and Impulse Invariance Methods

b Determine the zeros of the following FIR systems and indicate whether the system is minimum, maximum or mixed phase.

$$H_1(z) = 6 + z^{-1} - z^{-2}$$
$$H_2(z) = 1 - z^{-1} - 6z^{-2}$$

c Compute 4-point DFT of a causal four sample sequence given by x(n)= {j, 0, j, 1}

d State and prove any two properties of DFT

e What is multirate DSP? State its applications.

2 a Compute DFT of the following sequence using DIT FFT algorithm **[10]**
x(n) = {0.5, 0.5, 0.5, 0.5, 0, 0, 0, 0}

b Write a short note on pipelining in the DSP processor and MAC unit. **[10]**

3 a Given H(s) = [3/(s+2)(s+3)], T=0.1 sec. Design digital IIR filter using BLT method. Explain advantages of BLT over IIM method **[10]**

b Realize the following IIR filter function by lattice realization structure. **[10]**

$$H(z) = \frac{1}{1 + \frac{3}{4}z^{-1} + \frac{1}{2}z^{-2} + \frac{1}{4}z^{-3}}$$

4 a Design a linear phase FIR low pass filter using rectangular window by taking 7 samples of window sequence and with cutoff frequency wc=0.2π rad/sample **[10]**

b Design a FIR low pass filter with the following desired frequency response. **[10]**

$$H(e^{j\omega}) = \begin{cases} e^{-j2\omega}, -\frac{\pi}{4} \le w \le \frac{\pi}{4} \\ 0, \quad Otherwise \end{cases}$$

5 a Explain concept of decimation by integer D. **[10]**

b Find the circular convolution of the sequences using DFT **[10]**
X(n)={1, 2, 1, 2} and h(n)={4, 0, 4, 0}

6 a Write a short note on Limit cycle oscillations **[10]**

b Write a short note on Product quantization error and input quantization error **[10]**

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