Q.P. CODE: 37021

Time 3 hours **Marks: 80**

N.B: (1) Questions NO.1 is compulsory.
(2) Attempt any three questions out of remaining five questions.
(3) Assume suitable data if required.
(4) Figures to the right indicate full marks.

Q 1.Solve any four 20

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

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

b. What is multirate DSP? State its applications

c. Compare BLT and impulse invariant method.

d. Explain concept of decimation by integer D.

e. If X(K)={16,-4,0,-4}, determine x[n] using IFFT.

Q 2. a) If x(n)={ 1,2,3,} and h(n)= {1,0}

1) Find linear convolution using circular convolution.
2) Find circular convolution using DFT-IDFT. 10

b) Show the mapping from S plane to Z plane using impulse invariant method. Explain its limitations. Using this method determine H(z) if

$H(s)=\frac{2}{(s+1)(s+2)}$ if Ts=1s. 10

Q3. a) Compute DFT of sequence x(n)={ 1,2,3,4,5,6,7,8} using DIT-FFT algorithm. 10

b) Design low pass IIR Butterworth filter for following specifications

Passband attenuation =1dB

Stopband attenuation =40dB

Passband edge frequency=200Hz

Stopband edge frequency=540Hz

Sampling frequency=8KHz

Use Bilinear transformation method. 10

Q 4. a) A low pass filter is to be designed with following desired frequency response.

$Hd(e^{jw})=e^{-j2w}$ $\quad -\frac{\pi}{4} \leq w \leq \frac{\pi}{4}$

$=0$ $\quad \frac{\pi}{4} < w \leq \pi$

Determine the filter coefficients $h_d(n)$ if the window function is defined as

$w(n)=1 \quad 0 \leq n \leq 4$

$=0 \quad$ otherwise

Also determine the frequency response $H(e^{jw})$ of the designed filter. 10

b) Find DFT of $x(n)=\{1,2,3,4\}$. Using these results not otherwise find DFT

i) $x_1(n)=\{4,1,2,3\}$

ii) $x_2(n)=\{2,3,4,1\}$

iii) $x_3(n)=\{6,4,6,4\}$ 10

Q 5 a) Explain subband coding of speech signal as a application of multirate signal processing. 10

b) Determine the Direct form-I and Direct form-II realization for the system $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$. 10

Q6. Write Short note on

a) Dual Tone Multifrequency Detection using Goertzel's algorithm 07

b) The effects of coefficients quantization in FIR filters. 07

c) Concept of interpolation by integer factor I 06

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