

Extc - VI CBS U

18/5/18

D.T.S.P.

Q.P. CODE: 37021

Marks: 80

Time 3 hours

- 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.

1. Solve any four

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

What is multirate DSP? State its applications

Compare BLT and impulse invariant method

Explain concept of decimation by integer D

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

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

- 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 limitations. Using this method determine $H(z)$ if

$s = \frac{-1}{s+1} + \frac{1}{s+2}$ 10

3. 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

$$H_d(e^{j\omega}) = e^{-j2\omega}$$

$$= 0$$

$$\frac{\pi}{4} < \omega < \frac{3\pi}{4}$$

$$\frac{\pi}{4} < \omega < \frac{3\pi}{4}$$

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

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

$$= 0 \quad \text{otherwise}$$

Also determine the frequency response $H(e^{j\omega})$ of the designed filter

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

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

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

Q6. Write Short note on

a) Dual Tone Multifrequency Detection using Goertzel's algorithm

b) The effects of coefficients quantization in FIR filters.

c) Concept of interpolation by integer factor I

1.
2.
3.
4.