Total No. of Questions : 10]

SEAT No. :

P2963

[Total No. of Pages : 3

[5460]-552
T.E. (E & TC) (End Semester)
DIGITAL SIGNAL PROCESSING
DSP (Digital Signal Processing)
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagram must be drawn whenever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Your answers will be valued as a whole.***
4) ***Assume suitable data if necessary.***

Q1) a) Show the mapping between analog frequencies and digital frequencies. **[4]**

b) Explain the concept of Eigen values and Eigen vector, Find the Eigen values of given matrix A as given below: **[6]**

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 2 \end{bmatrix}$$

OR

Q2) a) Explain the cyclic property of twiddle factor for 8 point DFT. **[4]**

b) Find linear convolution using overlap save method of the following sequences: **[6]**

$x(n) = \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\}$ and $h(n) = \{1, 2, 3\}$

Q3) a) Explain how ROC is important to determine the causality and stability of LTI discrete time system. **[4]**

b) Draw signal flow graph of radix-2 DIF FFT algorithm for N=4. **[6]**

OR

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Q4) a) State and prove the convolution property of Z transform. **[6]**

b) Show relation between Fourier Transform and Z-Transform. **[4]**

Q5) a) Comparison between Impulse invariance and bilinear transformation method. What is prewarping? **[9]**

b) A Digital filter has frequency specification as:

Pass band Frequency = $\omega_p = 0.2\pi$ **[9]**

Stop band Frequency = $\omega_s = 0.3\pi$

What are the corresponding specifications for pass band and stop band frequencies in analog domain if,

i) Impulse invariance technique is used for designing.

ii) BLT method is used for Designing.

OR

Q6) a) Obtain direct form I and Direct form II realization of a LTI system described difference equation as given below: **[9]**

$3y(n) - 2y(n-1) + y(n-2) = 4x(n) - 3(n-1) + 2x(n-2)$

b) Give the properties and characteristics of chebyshev and Butterworth filter, Give salient features of Low Pass Butterworth Filter. **[9]**

Q7) a) What is Gibbs Phenomenon? Explain Importance of windowing functions to design FIR filter in details. **[8]**

b) Distinguish between IIR and FIR filter, Why ideal filter cannot be realized practically? **[8]**

OR

Q8) a) Design an FIR filter with Hamming window for desired impulse response given below: **[8]**

$$H_d(w) = e^{-3jw}; -\frac{\pi}{4} \le w \le \frac{\pi}{4}$$

$$= 0 : \frac{\pi}{4} \le w \le \pi$$

b) Explain finite word length effect in Digital FIR filter. What do You understand by linear phase response? **[8]**

Q9) a) Explain different types audio crossover systems? Why digital crossover is preferred? **[8]**

b) Explain compact disc recording system with the help of block schematic. **[8]**

OR

Q10) Write short notes : (Any Two) **[16]**

a) Vibration analysis for Defective Gear Teeth.

b) Voice Coders (Vocoders)

c) Speech noise Reduction

d) Explain how DSP is very useful to suppress the interference in ECG.