

TEC-502

Roll No.

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Odd Semester Examination, 2019-20

B. Tech: ECE/EEE

Semester: 5th

Digital Signal Processing

Max. Marks :100

Time: 3:00 hrs.

Total no. of printed pages: 2

Note : (i) Attempt ALL questions.  
(ii) In case of numerical problems assume data whenever not provided.

4X5=20

Q1. Attempt any four of the following

- What is an IIR filter? Compare its characteristic with FIR filter.
- What do you understand by a linear phase filter?
- What is Kaiser Window? In what way it superior to other window function?
- Explain bit reversal and In place computation.
- Explain and prove the property of Multiplication of two DFTs
- Compute (a) Linear and (b) Circular periodic convolutions of the two sequences  $x_1[1, 1, 2, 2]$  and  $x_2[1, 2, 3, 4]$ .

4X5=20

Q2. Attempt any four of the following

- Draw the transposed Direct Forms I structures of a third order IIR filter.
- Explain any four properties of the DFT in brief.
- Explain how DFT can be used as a linear transformation tool in Digital signal Processing.
- What is meant by frequency warping? What is the cause of this effect?
- What are the difference between Butterworth Filters and Chebyshev Filters?
- What are the desirable features of the window functions?

2x10=20

Q3. Attempt any two of the following

- Compute 4 point DFT of the following sequence using linear transformation matrix  
 $X(n) = (1, 2, 3, 4)$
- Describe the following:
  - Butterworth Filters
  - Chebyshev Filters
- Given  $x[n] = [2, 2, 2, 2, 1, 1, 1, 1]$ , find  $X[k]$  using DIT FFT algorithm.

2x10=20

Q4. Attempt any two of the following

(a) Draw the structures of cascade and parallel realization of

$$H[z] = \frac{(1-z^{-1})^3}{(1-\frac{1}{2}z^{-1})(1-\frac{1}{8}z^{-1})}$$

(b) The desired frequency response of a low pass filter is

$$H_d(e^{j\omega}) = \begin{cases} 1, & \text{for } -\frac{3\pi}{4} \leq \omega \leq \frac{3\pi}{4} \\ 0, & \text{otherwise} \end{cases}$$

Determine  $h_d(n)$ . Also find  $h(n)$  using the symmetric rectangular window of length = 7.

(c) Design a digital IIR filter from second order analog filter using impulse invariance method assume

$T_s$

= 1 sec.

$$H[s] = \frac{1}{(s+1)(s+2)}$$

2x10=20

Q5. Attempt any two of the following

(a) Determine the Direct Forms I and II realization for a third order IIR transfer function

$$H[z] = \frac{0.28z^2 + 0.319z + 0.04}{0.5z^3 + 0.3z^2 + 0.17z - 0.2}$$

(b) Using the block diagram explain the adaptive equalization.

(c) Compute the Walsh Transform of the sequence {8, 5, -1, 3}.

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