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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2017

Branch: ELECTRICAL & ELECTRONICS ENGINEERING

Stream: ***POWER CONTROL & DRIVES***

Course Code & Name: ***01EE6503 ADVANCED SIGNAL PROCESSING***

Answer *any two full* questions from *each* part

Limit answers to the required points.

Max. Marks: 60 Duration: 3 hours

PART A

1. a. Find the circular convolution of the following sequences using DFT and IDFT method:

$x(n) = \{1 \quad 1 \quad 2 \quad 1\}$ and $h(n) = \{1 \quad 2 \quad 3 \quad 4\}$ (8 marks)

b. Find the system function and the impulse response of the system described by the difference equation: $y(n) = x(n) + 2x(n-1) - 4x(n-2) + x(n-3)$ (2 marks)

2. a. Determine the Z transform including the region of convergence for each of the following using their properties:

(i) $x(n) = na^n u(n)$ (ii) $x(n) = na^{n-1}u(n)$ (4 marks)

b. Determine the inverse Z transform of the following:

$X(z) = \dfrac{z(z^2 - 4z + 5)}{(z-3)(z-1)(z-2)}$ ROCs: i) $2<|z|<3$ ii) $|z|>3$ iii) $|z|<1$ (6 marks)

3. a. Compute the 8-point DFT of the following sequence using DIT-FFT radix 2 algorithms. $x(n) = \{1 \quad 1 \quad 1 \quad 1 \quad 0 \quad 0 \quad 0 \quad 0\}$ (6 marks)

b. Test the time invariance, linearity and causality of the following;

$y(n) = x(-n)$ (2) $y(n) = |x(n)|$ (4 marks)

PART B

4. a. Obtain H(z) using the Impulse invariant technique for an analog system function which is given by

$Ha(s) = \frac{1}{(s+0.5)(s^2+0.5s+2)}$ (6 marks)

b. Briefly explain the finite word length effects in the realization of digital filters. (4 marks)

5. a. Design the band-pass linear phase FIR filter having cut-off frequencies of $\omega_{c1} = 1$ rad/sample and $\omega_{c2} = 2$ rad/sample. Obtain the unit sample response through following window.

$$\omega(n) = \begin{cases} 1 & for \quad 0 \le n \le 6 \\ 0 & elsewhere \end{cases}$$

Also, obtain the magnitude/frequency response. (7 marks)

b. Explain the steps involved in the design of FIR filter (3 marks)

6. a. Briefly explain about quantization errors introduced due to truncation and rounding. (5 marks)

b. Briefly explain about Discrete Fourier Transform Computations. (5 marks)

PART C

7. a. Explain the need for time frequency Analysis. Also discuss about the time distribution and frequency distribution (4 marks)

b. Briefly explain the sampling rate conversion by a rational factor I/D. (6 marks)

8. a. Briefly explain the addressing modes of TMS C240 DSP processor (5 marks)

b. Briefly explain direct form FIR structure (5 marks)

9. a. Compare Time Frequency analysis with Wigner Distribution. (5 marks)

b. Write a note on interfacing of digital systems with different sampling rates. (5 marks)