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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTERM.TECH DEGREE EXAMINATION, DECEMBER 2018

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. Determine the following sequences using the DFT and IDFT

$x_3(n) = x_1(n) \otimes x_2(n)$

$x_1(n) = [1,2,3,1]$, $x_2(n) = [4,3,2,2]$ (7 marks)

b. Check whether the following system $y(n) = x(n^2)$ is causal or not

(2 marks)

2. a. Find the Z transform including region of convergence for the following.

a) $x(n) = (n + 0.5)(\frac{1}{3})^n u(n)$

b) $x(n) = \left(\frac{-1}{5}\right)^n u(n) + 5\left(\frac{1}{2}\right)^{-n} u(-n-1)$ (4 marks)

b. Compute the response of the system

$y(n) = 0.7y(n-1) - 0.12y(n-2) + x(n-1) + x(n-2)$ to input x (n) = nu (n).

(5 marks)

3. a. Obtain a 8 point DFT of the sequence x(n)={1,2,2,2,1,0,0,0} using radix 2 DIF FFT Algorithm. (7 marks)

b. Find the stability of the system whose impulse response is : $h(n)=2^n u(n)$ (2 marks)

PART B

4. 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. (9 marks)

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

b. Compare FIR and IIR filters (3 marks)

6. 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 about Discrete Fourier Transform Computations. (3 marks)

PART C

7. a. Briefly explain the functional block diagram of TMS320F240 digital signal processor. (8 marks)

b. Differentiate between STFT and Wigner distribution. (4 marks)

8. a. Explain the sampling rate increase by an integer factor I and derive the input and output relationship in both time and frequency domains. (7 marks)

b. Briefly explain the design of Phase shifters (5 marks)

9. a. Briefly explain the multistage implementation of sampling rate conversion (4 marks)

b. Briefly explain the direct form FIR filter structure with efficient implementation of Decimator & Interpolator. (8 marks)