Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE407

Course Name: DIGITAL SIGNAL PROCESSING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1 State any five properties of DFT. (5)

2 Explain single stage lattice structure for an FIR filter with neat diagram and equations. (5)

3 For the analog transfer function H(s) = $\frac{1}{(s+1)(s+2)}$, determine H(z) using impulse invariance method for T=1 sec. (5)

4 What do you understand by linear phase response? Mention the characteristics of linear phase FIR filter. (5)

5 What is meant by product quantization error in digital signal processing? (5)

6 Define is zero input limit cycle oscillation with an example. (5)

7 Define the function of (i) Program Counter (ii) Program Address Register (iii) Stack and (iv) Microstack (5)

8 How the instruction set of TMS 320C24x processor is classified? (5)

PART B

Answer any two full questions, each carries 10 marks.

9 Calculate the 8-point DFT of x[n] using Decimation in Frequency FFT Algorithm. x[n]= {0,1,2,3,4,5,6,7} (10)

10 a) Perform the linear convolution of the following sequences using overlap-add method. x(n) = {1, -2, 2, -1, 3, -4, 4, -3} and h(n)={1,-1} (5)

b) Determine the cascade form realization for the transfer function of an FIR digital filter which is given by (5)

$$H(Z)=\left(1-\frac{1}{4}Z^{-1}+\frac{3}{8}Z^{-2}\right)\left(1-\frac{1}{8}Z^{-1}-\frac{1}{2}Z^{-2}\right)$$

11 Realize using direct 1 form, direct-2 form and cascade form representation of filter given by transfer function (10)

$$H(z)=\frac{8-4z^{-1}+11z^{-2}-2z^{-3}}{\left(1-\frac{1}{4}z^{-1}\right)\left(1-z^{-1}+\frac{1}{2}z^{-2}\right)}$$

PART C

Answer any two full questions, each carries 10 marks.

12 Using Bilinear transformation, design a Butterworth filter which uses a sampling rate of 1 kHz, to satisfy following specifications (10)

$$0.8 \le \left|H\left(e^{jw}\right)\right| \le 1 \text{ for } 0 \le |w| \le 0.2\pi$$

$$\left|H\left(e^{jw}\right)\right| \le 0.2 \text{ for } |w| \ge 0.6\pi$$

13 a) Derive the equation for transformation of H(s) to H(z) using impulse invariance method. Discuss about stability of the system after transformation. (5)

b) Compare Rectangular and hanning window with the help of required equations. (5)

14 Using frequency sampling method, design a band pass filter with following specifications. (10)

Sampling frequency f=10 kHz, Cut-off frequencies $f_{c1}=2000kHz$ and $f_{c2}=4000kHz$. Take N=7.

PART D

Answer any two full questions, each carries 10 marks.

15 a) In the given IIR system, the products are rounded to 4 bits including sign bit. (7)

$$H(z)=\frac{1}{\left(1-0.35z^{-1}\right)\left(1-0.62z^{-1}\right)}$$

Find the output round off noise power in direct form realization.

b) Compare the fixed point and floating point arithmetic. (3)

16 a) What are the methods used to prevent overflow in digital filter implementations? (5)

b) Defineany five I/O instructions used in TMS320C24x (5)

17 What are the addressing modes in TMS 320C24x processor? Describe with examples. (10)

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