Reg No.:_______________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION**(R&S)**, MAY 2019

Course Code: AE306

Course Name: DIGITAL SIGNAL PROCESSING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

1	a)	Find the DFT of a sequence x(n)={1,2,3,4,4,3,2,1} using DIT algorithm.	(8)
	b)	Check if all the roots of the characteristic equation $z^3+0.25z^2+z+0.25=0$ lie within the unit circle using Jury's test.	(7)
2	a)	State and explain sampling theorem	(3)
	b)	Find the nyquist rate of $x(t)=\sin 400\pi t+\cos^2 500\pi t$	(4)
	c)	Determine the Z transform and ROC of I. $x_1(n) = (2)^n \cos\omega n$ II. $x_2(n) = nu(n)$.	(8)
3	a)	Find the DTFT of $x(n)=a^{\|n\|}$	(3)
	b)	Find the inverse Z transform of $X(z)=\frac{z}{(z-\frac{1}{2})(z-2)}$ for all possible ROC's.	(9)
	c)	Compare the computational complexities of DFT computation for N=16 using DIT FFT and direct method.	(3)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	Design an ideal digital differentiator with frequency response $H_d(e^{j\omega})=j\omega$ for $-\pi \le \omega \le \pi$ using rectangular window with N=8	(7)
	b)	For the analog transfer function $H(s)=\frac{2}{(s+1)(s+2)}$, determine H(z) using impulse invariance method (Assume T=1 sec)	(8)
5	a)	Using bilinear transform, design a high pass filter, monotonic in pass band with cut off frequency of 1000Hz, α_p=3dB and, α_s=10dB at 350Hz. The sampling frequency is 5000Hz	(10)
	b)	Design an ideal low pass FIR filter with $H_d(e^{j\omega})=1$ for $-\frac{\pi}{2} \le \omega \le \frac{\pi}{2}$ $= 0$ for $\frac{\pi}{2} \le \|\omega\| \le \pi$ Find h(n) for L=11 using direct truncation	(5)

6 a) Explain the classification of linear phase FIR filter (10)

b) Given the specification α_p=1dB, α_s=30dB, Ωp=200 rad/sec and, Ωs=600 rad/sec. Determine the order of the filter. (5)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Obtain the direct form I, direct form II, cascade and parallel realization of the system $H(z)=\frac{1+\frac{1}{3}z^{-1}}{1-\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}$ (10)

b) Draw and explain the architecture of TMS 320C 5X (10)

8 a) Explain the von-Neumann architecture with a neat block diagram. (10)

b) Realize the following FIR system function using minimum number of multipliers (5)

$H(z)=\{1+\frac{1}{2}z^{-1}+\frac{1}{2}z^{-2}+\frac{1}{3}z^{-3}\}\{1+\frac{1}{3}z^{-1}\}$

c) Explain the fixed point and floating point representation of numbers (5)

9 a) Explain (10)

I. Harvard architecture

II. Pipelining

b) Explain the effects of quantization and round off in digital filter coefficients (6)

c) Explain the errors resulting from rounding and truncating (4)

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