Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Regular and Supplementary Examination July 2021

Course Code: IC304

Course Name: DISCRETE TIME SIGNAL PROCESSING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a)	State and prove sampling theorem for band limited signals with necessary diagrams.	(10)
	b)	Define Nyquiste rate. What is the Nyquiste rate of a signal ranging 300 Hz to 3.3 KHz?	(5)
2	a)	Explain in detail about the significance of Decimator and Interpolator in Signal Sampling.	(8)
	b)	Perform the circular convolution of $x_1(n) = \{1, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$ in graphical method.	(7)
3	a)	Consider two finite duration sequences $x_1(n)$ *and* $x_2(n)$ of length N with DFTs $X_1(k)$ *and* $X_2(k)$. If $X_3(k) = X_1(k)X_2(k)$ then prove that $x_3(n) = \sum_{m=0}^{N-1} x_1(m)x_2((n-m))_N$	(12)
	b)	List out any three properties of DFT.	(3)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	What are the advantages of FFT algorithm?	(3)
	b)	Compute 8 point DFT of $x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$ by radix-2 DIT FFT.	(12)
5	a)	Explain the procedure to compute the IDFT of the sequence using DIF FFT algorithm.	(3)
	b)	Compute the IDFT of $X(k) = \{3, -j, 1, j\}$ using DIT FFT algorithm.	(4)
	c)	Write short notes on	(8)
		(i) Quantization Noise	
		(ii) Limit cycle oscillations.	

6 a) Realize the system with difference equation $y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n) + \frac{1}{3}x(n-1)$ in cascade form. (10)

b) Determine the Direct form realization of system function $H(z) = 1 + 2z^{-1} - 3z^{-2} - 4z^{-3} + 5z^{-4}$ (5)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Derive the expression for 3rd order butterworth polynomial. (10)

b) Reveal your idea about warping effect. (4)

c) Explain the steps to design a digital IIR filter using bilinear transform technique. (6)

8 a) For the analog transfer function $H(s) = \frac{3}{(s+2)(s+3)}$ determine $H(z)$ using impulse invariance method. Assume T=1 Sec. (10)

b) Write short notes on (10)

(i) Kaiser window

(ii) Rectangular window

9 a) Design a filter with (15)

$H_d(e^{j\omega}) = e^{-j\omega}$ for $\frac{-\pi}{4} \leq \omega \leq \frac{\pi}{4}$

$= 0$ for $\frac{\pi}{4} \leq |\omega| \leq \pi$

Using a Hanning window with N=7.

b) Explain the design procedure of FIR Filters using Fourier series method. (5)

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