Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India

(Autonomous College Affiliated to University of Mumbai)

MID Semester Examination

OCTOBER 2023

Max. Marks: 30 | Duration: 60 Min

Class: TE AIML-DS | Semester: V

Course Code: AI302 | Branch: CSE

Name of the Course: Foundation of Signal & Image Processing

Instruction:

(1) All questions are compulsory.
(2) Use of scientific calculator is allowed.
(3) Draw neat diagram.
(4) Assume suitable data if necessary with justification.

		Max. Marks	CO
Q.1	Attempt the following Short Answer Questions.		
	a) Let x[t]= **$x(t) = 10\sin(200\pi t) - 8\cos(20\pi t)$** DT Signal is obtained by sampling x(t) with Sampling frequency Fs = 80 Hz. 1. What will be the frequencies in the resulting DT signal. 2. Determine if the resulting DT Signal x[n] will be periodic or not. If periodic then what would be the period.	2	CO1
	b) The first four points Six point DFT of real valued sequence x[n] are X[k] = { 0.25, 0.125 +j 0.3018, 1.25 – j0.518, 0.5 } Find the remaining values. Justify the answer.	2	CO1
	c) Let $x(n) = \left(\frac{1}{2}\right)^n u(n) + 8^n\, u(-n-1)$ Find the Energy of signal x[n].	2	CO1
	d) Consider a continuous time signal x[t] which is sampled with sampling frequency Fs= 1000 Hz. The samples thus obtained are converted to frequency domain using Fourier Transform. 1. How many Complex multiplications and Complex additions are required per second if DFT is used ? 2. How many Complex multiplications and Complex additions will be required per second if FFT is used by converting the sample count N per second to a radix 2 number ?	2	CO1
	e) Determine whether the following Systems are Linear /Non Linear & Time Invariant / Time Variant. 1) $y[n] = x^2[n]$ 2) $y[n] = \sin(x[n])$	2	CO1

Q.2	Given a[n] = { 10, 20, 30, 40 } and A[k] = { 100, -20+20j, -20, -20-20j } where A[k] is DFT of a[n]. (a) Let b[n] = { 10, 40, 30, 20 } Find B[k] using A[k]. (b) Let c[n] = { 20, 60, 60, 60 } Find C[k] using A[k]. (b) Let d[n] = { 40, 30, 20, 10 } Find D[k] using A[k].	6	CO1
Q.3	FIR system with impulse response h[n] = { 5, 6 } . Find the response of the system to the input x[n] = { 1, 0, 3 } using FFT-IFFT.	6	CO1
Q.4	Given that x[n] = { **(1 + 2 j), (1 + j) , (2 + j), (2 + 2 j)** } Find X[k].	4	CO1
Q.5	Given x(n) = u(n) – u(n – 3) h(n) = u(n – 1) + u(n – 2) – u(n – 4) – u(n – 5) Find Circular Convolution of x[n] and h[n].	4	CO1