End Semester Examination-August 2023

Max. Marks: 100

Class: T. Y. B. Tech

Course Code: IT303

Name of the Course: Foundation of Signal Processing

Duration: 3hrs

Semester: VI

Branch: Computer/IT

Instruction:

(1) All questions are compulsory

(2) Draw neat diagrams

(3) Assume suitable data if necessary

(4) If answers of explain or discuss are identical or appears to be copied, NO student gets marks for those questions

Q. No.		Marks	CO
Q. 1 (a)	State and Derive Sampling Theorem For an analog signal $x(t) = 3 \cos(50 \Pi t) + 10 \sin(300 \Pi t) - \cos(100 \Pi t)$. Obtain DT signal x[n] and Calculate first 10 samples of x[n] sampled at 1000 Hz.	10	CO1
Q. 1 (b)	Let $h(n) = \left(\frac{1}{5}\right)^n$ for $n = 0, 1, 2, 3$ Find the response of the system when input $x(n) = u(n)$.	10	CO1
Q. 2 (a)	Given $x(n) = \{1, 0, 2, 0, 3, 0, 4, 0\}$. Find 8 Point X[k]. Let $p[n] = \{1, 1, 2, 2, 3, 3, 4, 4\}$. Find P[k] in terms of X[k].	10	CO2
Q. 2 (b)	Derive the DFT of the sample data sequence $x(n) = \{1, 1, 2, 2, 3, 3\}$ and compute the corresponding amplitude and phase spectrum **(OR)** The first five DFT points of real and even sequence x(n) of length eight are given below. Find the remaining three points $X(k) = \{5, 1, 0, 2, 3, \ldots\}$. Thus find the Inverse DFT of the sequence.	10	CO2
Q. 3 (a)	$x(n) = \{10, 20, 30, 40\}$, find DFT X[k]. Using results obtained above, and not otherwise, find the DFT of the following sequences $x_1[n] = \{40, 10, 20, 30\}$ $x_2[n] = \{20, 30, 40, 10\}$ $x_3[n] = \{30, 40, 10, 20\}$ $x_4[n] = \{60, 40, 60, 40\}$	10	CO2

Q. 3 (b)	Obtain the DFT of the the following using DIT-FFT $\{1, 2, 1, 2, 0, 2, 1, 2\}$	10	CO2
Q. 4 (a)	Obtain Circular Convolution of $x[n] = \{1, 2, 2, 1\}$ and $h[n] = \{2, 1, 1, 2\}$ using FFT.. **(OR)** Use DFT to compute the linear convolution of the signals given below $x_1[n] = \delta(n) - 1\,\delta(n-1) + \delta(n-2)$ $x_2[n] = \delta(n-2) + 2\,\delta(n) + 2\,\delta(n-1)$	10	CO3
Q. 4 (b)	A 2nd order Low Pass FIR filter has causal impulse response $h[n] = \{1\ 2, 3\}$. Determine the output sequence response to the following input sequence using Overlap Add Method. Given input sequence : $x[n] = \{10, 20, 10, 40, 30, 20, 30, 25, 10, 10, 20, 10\}$	10	CO3
Q. 5 (a)	A real-time Audio signal bandlimited to 3400 Hz is required to be processed for noise filtering using a fast Algorithm. (a) Draw block diagram of the complete DSP system. Explain the purpose and working of each block. (b) Write Algorithms/Flowchart to address the problem.	10	CO4
Q. 5 (b)	Calculate Carl Pearson's Coefficient of Correlation of the following Discrete Time signals. Also comment on the type of correlation. $x_1[n] = 10\,\delta(n) - 13\,\delta(n-1) - 16\,\delta(n-2)$ $x_2[n] = 40\,\delta(n-2) - 60\,\delta(n) - 40\,\delta(n-3)$	10	CO4

* * *