MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEMESTER M. TECH (EMBEDDED CONTROL AND AUTOMATION)
END SEMESTER EXAMINATIONS APRIL 2024
DIGITAL SIGNAL PROCESSORS (ICE 5213)
Note: Answer All questions.

Time:3 Hours **30-04-2024** **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ALL** the questions.

Q. No.	Description	M	CO	PO'S	BL
1A	Appraise any four architectural features of TMS320C6x processors.	2	CO1	1,6	2
1B	Develop the functional block diagram of TMS320C6x processors and illustrate relevant functions of each block.	4	CO1	1,2,6	4
1C	Analyze the different stages of pipelining process in digital signal processors.	4	CO2	1,2,4	4
2A	Evaluate the essential criteria of the transfer function of a stable and causal digital filter.	2	CO3	1,6	2
2B	Illustrate the mapping of poles and zeros in bilinear transformation technique of IIR filter design.	4	CO3	1,4	2
2C	Determine the poles of a second order low pass Butterworth filter. Sketch the location of poles and obtain the normalized transfer function of the filter.	4	CO3	1,4,5	3
3A	Contrast the Chebyshev filter and Butterworth filter designs.	2	CO3	1,4,5	2
3B	Derive the Direct form I and II structures for the given H(z). $H(z) = \frac{Y(z)}{X(z)} = \frac{0.1708 + 0.3415\,z^{-1} + 0.1708\,z^{-2}}{1 - 0.5407\,z^{-1} + 0.2237\,z^{-2}}$	3	CO3	1,4,5	3
3C	Design a linear phase FIR high pass filter using Hamming window, with a cutoff frequency, $w_c = 0.8\pi$ rad/sample and the length of the filter is 7.	5	CO3	1,4,5	5
4A	Derive expressions to justify FIR filter as a linear phase filter.	2	CO3	1,4,5	2
4B	Compare the basic butterfly signal flow graph of DIFFFT and DITFFT algorithms.	3	CO4	1,4,5,6	3

4C	Determine the DFT of the sequence x(n) = {-1, 2, 2, 2, -1} using radix 2 DIT FFT algorithm.	**5**	**CO4**	**1,4,5,6**	**3**
5A	Given the sequence, x(n) = {1, 1, –2, –2}, evaluate its DFT using direct DFT method.	**2**	**CO5**	**1,4,5**	**3**
5B	Justify the application of adaptive filter structure for noise cancellation in systems.	**3**	**CO4**	**1,4,5,6**	**2**
5C	Compute the percentage saving in computing complex additions and multiplications for a 64-point radix-2 FFT in comparison with direct DFT.	**5**	**CO4**	**1,4,5,6**	**5**