Q. Code:266358

Reg. No. | | | | | | | | | | | | | |

B.E. DEGREE EXAMINATION, MAY 2023

Fifth Semester

EE18505 – DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

(Regulations 2018)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 Understand the fundamental aspects of digital signal processing.
CO 2 Acquire knowledge on various discrete-time signals and systems.
CO 3 Analyze domain specific discrete time systems and evaluate frequency response and stability analysis.
CO 4 Design and realize FIR and IIR filters.
CO 5 Apply the knowledge on the basic architectures of commercial digital signal processors to electrical and electronics engineering.

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Define Nyquist rate.	**1**	**1**
2.	Find the mathematical representation for x (n) = {1, 2, 4, 1}.	**1**	**2**
3.	Determine the ROC and Z transform of x (n) = u (-n-1).	**2**	**2**
4.	State the conditions for a system to be stable with respect to the Z plane.	**2**	**1**
5.	What is zero padding in DFT?	**3**	**2**
6.	Determine the computational complexity in 32 point DFT and 32 point DIT-FFT.	**3**	**2**
7.	What is the need for windowing?	**4**	**2**
8.	Define frequency warping.	**4**	**1**
9.	List the different buses in the TMS320C54 processor.	**5**	**2**
10.	What are the various registers in the TMS320C54 processor?	**5**	**1**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Find if the following systems are Linear, Time varying, Causal and Stable or not. (i) y(n) = x (n)cos[x (n)] and (ii) y(n) = x (n) – x(n-1).	**(14)**	**1**	**4**
	(OR)			
(b)	Discuss the classification of various discrete-time systems in detail with an example for each.	**(14)**	**1**	**4**

12. (a)	Given x (n) = {1, -2, 1} and h (n) = {1, 1, 1}. Determine the output, y (n) using (i) linear convolution and (ii) Z-transform.	**(14)**	**2**	**3**
	(OR)			
(b)	Determine the inverse Z transform of X (z) =Z $[Z^2-4Z+5] / [(Z-1)(Z-2)(Z-3)]$ for ROC: (i) $\|z\| > 3$; (ii) $2 < \|z\| < 3$; (iii) $\|z\| < 1$	**(14)**	**2**	**3**
13. (a)	Find the output of the sequence x (n) = {0, 1, 2, 3, 4, 3, 2, 1} using (i) DFT and (ii) DIT-FFT.	**(14)**	**3**	**3**
	(OR)			
(b)	Obtain the 8-point DIT-FFT flow graph using derivations.	**(14)**	**3**	**3**
14. (a)	Analyze the design procedure for Butterworth filters.	**(14)**	**4**	**4**
	(OR)			
(b)	Design a digital Chebyshev filter to meet the following constraints by using impulse invariant transformation.	**(14)**	**4**	**4**

$$0.8 \le \left|H\left(e^{j\omega}\right)\right| \le 1 \qquad 0 \le \omega \le 0.2\pi$$

$$\left|H\left(e^{j\omega}\right)\right| \le 0.2 \quad 0.6\pi \le \omega \le \pi$$

15. (a)	Discuss the instruction set and addressing modes in TMS320C54 processor.	**(14)**	**5**	**2**
	(OR)			
(b)	Draw the internal architecture of the processor TMS320C54 and explain the various blocks.	**(14)**	**5**	**2**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Evaluate the circular convolution of the given signals, x_1 (n) = {1, 2, 3, 1} and x_2(n) = {4, 3, 2, 2}.	**(10)**	**2**	**5**

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