Q. Code:922351

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

B.E. / B. TECH DEGREE EXAMINATIONS, MAY 2024

Fifth Semester

EE18505 – DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

(Regulations 2018/2018A)

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

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

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What condition to be satisfied for the system is said to be stable?	**1**	**2**
2.	State sampling theorem.	**1**	**1**
3.	Differentiate linear convolution and circular covolution.	**2**	**2**
4.	Determine the z- transform and ROC of the delayed unit step sequence, u (n-1).	**2**	**2**
5.	Write the expression for determine N point IDFT.	**3**	**2**
6.	Compare the number of complex additions and multiplications for N-point DFT and FFT.	**3**	**2**
7.	List out the different realization of FIR systems.	**4**	**2**
8.	Mention the properties of Chebyshev filter.	**4**	**1**
9.	What are the different stages involved in pipelining?	**5**	**1**
10.	Give an example for register addressing mode.	**5**	**1**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Explain in detail about the any one of the analog to digital conversion technique.	**(08)**	**1**	**3**
	(ii)	Determine if the system described by the following input-output equation is linear or non-linear. (a) $y(n) = x^2(n)$ and (b) $y(n) = n\,x(n)$	**(06)**	**1**	**3**
		(OR)			
(b)	**(i)**	Determine if the following systems are time variant or time-invariant. (a) $y(n) = x(n) + x(n-2)$ and (b) $y(n) = x(-n)$	**(06)**	**1**	**3**

	(ii)	Determine the values of power and energy of the following signal. Find whether the signals are power, energy or neither energy nor power signals (a) $x(n) = \sin(n\pi/4)$ and (b) $x(n) = e^{2n}\, u(n)$	**(08)**	**1**	**3**
12. (a)	**(i)**	Find the z transform of the sequence, $x(n) = (1/4)^{n-1} u(n-1)$.	**(07)**	**2**	**3**
	(ii)	Determine the z transform of $x(n) = r^n \sin(n\theta)\, u(n)$.	**(07)**	**2**	**3**
		(OR)			
(b)	**(i)**	Find the inverse Z transform of $X(z) = \log(1 - 0.5z^{-1})$; ROC: $\|z\| > 0.5$ using differentiation property.	**(06)**	**2**	**3**
	(ii)	Find the convolution sum of two sequences, $x(n) = \{3, 2, 1, 2\}$ and $h(n) = \{1, 2, 1, 2\}$ ↑ .	**(08)**	**2**	**3**
13. (a)		Determine the 8-point DFT of the sequence $x(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}$. Plot its magnitude and phase spectrum for the same.	**(14)**	**3**	**4**
		(OR)			
(b)		Using radix-2 DIT FFT algorithm, Determine the 8 point DFT of a sequence $x(n) = \{1,1,1,1,1,1,1,1\}$. Verify your results with radix-2 DIF FFT algorithm.	**(14)**	**3**	**4**
14. (a)		Design a Chebyshev digital filter for the following specifications using bilinear transformation method. $0.8 \le \left\|H\left(e^{j\omega}\right)\right\| \le 1 \quad 0 \le \omega \le 0.2\pi$ $\left\|H\left(e^{j\omega}\right)\right\| \le 0.2 \quad 0.6\pi \le \omega \le \pi$	**(14)**	**4**	**4**
		(OR)			
(b)		Design an ideal high pass filter with a frequency response $H_d\left(e^{j\omega}\right) = 1 \text{ for } \frac{\pi}{4} \le \|\omega\| \le \pi$ $= 0 \text{ for } \|\omega\| \le \frac{\pi}{4}$ Find the values of h(n) for N = 11. Find H (z).	**(14)**	**4**	**4**
15. (a)		Explain with neat sketch about the internal architecture of TMS320C50 digital signal processor.	**(14)**	**5**	**3**
		(OR)			
(b)		Describe in detail about the motor control applications using digital signal processors.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Compute the convolution of two finite duration sequences $h(n) = a^n u(n)$ for all n and $x(n) = b^n u(n)$ for all n, when (i) a=b and (ii) a ≠ b.	**(10)**	**2**	**4**