Question Paper Code: R18A32EC03

R18

ANURAG Engineering College

(An Autonomous Institution)

III B.Tech II Semester Regular/Supplementary Examinations, June/July-2024

DIGITAL SIGNAL PROCESSING

(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)

Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Define linear and non-linear systems.	CO1	L1	2M
2.	List the applications of Z – transform?	CO1	L2	3M
3.	Define DFT of $x(n)$.	CO2	L1	2M
4.	Draw the basic butterfly diagram for DIT FFT algorithm.	CO2	L2	3M
5.	Why is the Butterworth response called a maximally flat response?	CO3	L2	2M
6.	What is warping effect? What is its effect on magnitude and phase response?	CO3	L1	3M
7.	What is the frequency of designing FIR filter using frequency sampling method?	CO4	L1	2M
8.	What are the advantages of the window technique for designing FIR filter?	CO4	L1	3M
9.	What is significance of interpolator in multirate DSP?	CO5	L1	2M
10.	What is the need for anti-aliasing filter prior to down sampling?	CO5	L2	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A) Determine transfer function and the frequency response for the system given by — CO1, L3, 10M

$$y(n) - \frac{4}{7}y(n-1) + \frac{1}{8}y(n-2) = x(n) + 5x(n-1)$$

OR

B) Draw the direct form-I and direct form-II structure of the following discrete time system. — CO1, L3, 10M

$$y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$$

12. A) Find the output sequence y(n) of a filter whose impulse response is **h(n)={1,1,1}**; and input signal **x(n)={3,-1,0,1,3,2,0,1,3,1}** using overlap save method. — CO2, L3, 10M

OR

B) i) Compute 4-point DFT of a sequence $x(n) = \{0,1,2,3\}$ using DIT algorithm. — CO2, L3, 6M

ii) Find the IDFT of a sequence $X(k) = \{1,0,1,0\}$. — 4M

13. A) Design a digital Chebyshev filter using Bilinear transformation method satisfying the constraint with T=1Sec. — CO3, L3, 10M

$$0.75 \le |H(e^{jw})| \le 1; for\ 0 \le \omega \le \pi/2$$

$$|H(e^{jw})| \le 0.2; for\ 0.75\pi \le \omega \le \pi$$

OR

B)	Discuss impulse invariance method. Convert the following analog filter into a digital filter by using the impulse invariant technique: $$H(S) = \frac{1}{(S+0.1)^2+9}$$	CO3	L3	10M
14. A)	Design a band pass filter which approximates the ideal filter with cutoff-frequencies at 0.2rad/sec and 0.3rad/sec. The filter order is M=7. Use the Hanning window function.	CO4	L3	10M
	OR			
B)	Derive an expression for system function if the unit sample response h(n) is obtained using frequency sampling technique.	CO4	L3	10M
15. A)	Discuss the sampling rate conversion by a rational factor I/D.	CO5	L3	10M
	OR			
B)	What are the applications of Multi Rate Signal Processing and explain any one of them.	CO5	L3	10M