



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:IV
Class:SY	Program:B.Tech
Branch Code:ETC	Pattern:2022
Name of Course:Digital Signal Processing	Course Code:ETC222011
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains two page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Question No. 1 Attempt following Question

- 1a) Find even and odd components of signals for following signal? (6) CO1

1) $x(t) = 1 + t + 2t^2 + 5t^3 + 9t^4$ 2) $x(n) = \{1, 3, 2, -2, 1\}$

Question No. 2 Attempt following Question

- 2a) Compute convolution integral for the given signal $x(t)=u(t)$ and $h(t)=u(t-3)$ using graphical method? (6) CO2

Question No. 3 Attempt following Question

- 3a) Determine the DFT of the following sequences, (8) CO3

1) $x(n) = \cos(n\pi/4)$ where $n=0,1,2,3$

2) $x(n) = \{0, 2, 4, 6\}$

OR

- 3b) Compute the circular convolution of two sequences $x_1(n) = \{1, 2, 2, 1\}$ and (8) CO3

$x_2(n) = \{1, 2, 3, 1\}$ using

- 1) Concentric circle method 2) matrix method

- 1) linear convolution 2) Circular convolution
- 3) circular convolution with zero padding.

OR

- 3d) If $x_1(n) = \{1, 2, 3, 4\}$ and $x_2(n) = \{5, 6, 7, 8\}$ by using linearity property, compute the DFT of the sequence (8) CO3

$$x_3(n) = 2x_1(n) + 3x_2(n).$$

Question No. 4 Attempt following Question

- 4a) Compute the DFT of $x(n) = 2\delta(n) + 3\delta(n-1) + 4\delta(n-2) + 5\delta(n-3)$ using DIF-FFT algorithm (8) CO4

OR

- 4b) Compute the DFT of $x(n) = \cos(n\pi/2)$ using DIT-FFT algorithm. Assume $N=4$. (8) CO4
- 4c) Show and Compare computational complexity is reduced if 16 point DFT is computed using Radix-2 DIF-FFT algorithm. (8) CO4

What is in-place computation?

OR

- 4d) Compute the IDFT using DIT-FFT of the given sequence $X(k) = (10, -2+2j, -2, -2-2j)$ (8) CO4

Question No. 5 Attempt following Question

- 5a) Determine the order and the poles of low pass Butterworth filter for the following specifications $\alpha_p = 1\text{db}$, $\alpha_s = 30\text{db}$ (8) CO5

$$\Omega_p = 200 \text{ rad/sec} \quad \Omega_s = 600 \text{ rad/sec}.$$

OR

- 5b) The transfer function of analog system is given of $H(s) = 2/(S+1)(S+2)$ (8) CO5
- Determine $H(z)$, using impulse invariance method. Assume $T=1\text{sec}$.

- 5c) Design an ideal low pass filter using hamming window, the filter coefficients are given as $h_d(n) = \sin(\pi/2 n) / (\pi n)$ for $n \leq 3$ and length of filter $N=7$. Find $H(z)$ and $H'(z)$. (8) CO5

OR

- 5d) Explain Gibb's Phenomenon. How it can be overcome? Write down the mathematical expression for the following windows (8) CO5

- 1) Rectangular 2) hamming 3) hanning 4) Blackman

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