K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:V
Class:TY	Program:B.Tech
Branch Code:ETC	Pattern:2023
Name of Course:Digital Signal Processing	Course Code:2302302
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.

		Marks	**CO**
Question No. 1			
1a)	Q1)Examine whether the following signal is periodic or non-periodic signal, if periodic determine the fundamental period $X(t)=3\sin 200\pi t + 4\cos 100t$.	(6)	CO1
Question No. 2			
2a)	Q2)Prove that following system is linear and time –invariant. $X(t)= x(t)+ x(t-2)$ for $t\geq 0$ and for $t < 0$	(6)	CO2
Question No. 3			
3a)	Q3a) Obtain 8 point DFT of the sequence given $x(n)=\{ 2, 2^2, 2^3, 2^4 \}$	(8)	CO3
	OR		
3b)	Q3b) i) If $x(n)=\{ 5, 6, 7, 4\}$ find DFT X(k) ,using results obtained in part i) and not otherwise find the DFT of the following sequence $x_1(n) = \{4, 5, 6 ,7\}$	(8)	CO3
3c)	Q3c)Perform the circular convolution for the following sequences using graphical method $x_1(n)= \delta(n)+ \delta(n-1)+ \delta(n-2)$ and $x_2(n)=2\,\delta(n) -\delta(n-1)+2\,\delta(n-2)$	(8)	CO3
	OR		
3d)	Q3d)Determine the output of a filter whose impulse response is $h(n)=\{1, 1, 1\}$ and input signal $x(n)=\{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$using overlap save method .	(8)	CO3
Question No. 4			
4a)	Q4a) Find DFT of the given sequence $x(n)= =\{8, 2, 3, 5, 4, 3, 6, 1\}$ using DIT- radix2 FFT algorithm.	(8)	CO4
	OR		

4b) Q4b)Compute DFT of the given sequence x(n)={3, 2, 1, 4, 1, 5, 2, 3} using DIF- radix2 FFT algorithm. (8) CO4

4c) Q4c)Compute IDFT using DIT-FFT of the given sequence X(k)= { 10, -8+8j , -3, -8-8j } (8) CO4

OR

4d) Q4d) Show that 21 times improvement in processing speed for multiplications is achieved if 32 point DFT is computed using radix -2 FFT algorithms. (8) CO4

Question No. 5

5a) Q5a)For the given specifications design an analog Butterworth filter, (8) CO5

$0.9 \leq |H(j\,\Omega)| \leq 1$ for $0 \leq \Omega \leq 0.2\pi$, $|H(j\,\Omega)| \leq 0.2\pi$ for $0.4\pi \leq \Omega \leq \pi$

OR

5b) Q5b)Design a Chebyshev filter with a given specifications α_P=2.5db , α_S= 30db, Ωp =20 rad/sec, Ωs =50 rad/sec. (8) CO5

5c) Q5c) Design a filter with $H_d(ej\omega)=e^{-5j\omega}$ for $-\pi/4 \leq \omega \leq \pi/4$ and $H_d(ej\omega)=0$ for $\pi/4 \leq |\omega| \leq \pi$ (8) CO5

Using Hamming window with N=5. Find H(Z)

OR

5d) Q5d)Design an ideal low pass filter with a frequency response (8) CO5

$H_d(ej\omega)= 1$ for $-\pi/2 \leq \omega \leq \pi/2$ and $H_d(ej\omega)=0$ for $\pi/2 \leq \omega \leq \pi$

Using Hanning window with N=5. Find H(Z)

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