

M. Sc. DEGREE END SEMESTER EXAMINATION : OCTOBER 2022**SEMESTER 3 : PHYSICS****COURSE : 21P3PHYT12 : DIGITAL SIGNAL PROCESSING***(For Regular - 2021 Admission)*

Duration : Three Hours

Max. Weights: 30

PART A**Answer any 8 questions****Weight: 1**

1. Define poles and zeroes of a system function. (U, CO 3)
2. Explain the different types of representation of discrete-time signals. (An, CO 1)
3. Name four different methods for digitalizing the analog filter to digital filter. (U, CO 4)
4. Give four advantages of using FIR filters over IIR filters in DSP. (A, CO 4)
5. Express the given sequence $x(n) = \delta(n-1) + 2\delta(n-2) + 3\delta(n-3)$ in terms of unit step function. (An, CO 1)
6. What do you mean by circular shift in periodic sequence? (U, CO 2)
7. What are periodic and aperiodic signals? (U, CO 1)
8. Distinguish between finite and infinite impulse response. (A, CO 4)
9. Calculate the percentage saving in calculations in a 256 point radix -2 FFT, when compared to direct DFT? (A, CO 2)
10. What is a two sided sequence? (R, CO 3)

(1 x 8 = 8)**PART B****Answer any 6 questions****Weights: 2**

11. Show that ZT of convolution of $x(n)$ and $h(n)$ is equal to $X(z)H(z)$. (A, CO 3)
12. Find the even and odd parts of the signal $(x(n) = (\sin \omega n + 1)^2)$. (A)
13. Test the linearity, causality, time-variance, stability and memory of the system governed by the equation: i) $y(n) = A \cos(\omega_0 n) x(n)$, ii) $y(n) = Ae^{x(n-1)}$ (E, CO 1)
14. Define and plot the following continuous- and discrete-time domain functions: (a) The delta or impulse function (b) The step function (c) The ramp function (d) exponential function (e) sinusoidal function. (A, CO 1)
15. Establish periodicity and symmetry properties of DFT. (A, CO 2)
16. What are linear phase FIR filters? Explain. (U, CO 4)
17. Obtain the angular distribution of normalized poles in an analog low pass butterworth filter design for order of filter N is odd. (An, CO 4)
18. Define Twiddle factor. Represent various powers of the Twiddle factors used in the computation of 8-point DFT in the unit circle. (U, CO 2)

(2 x 6 = 12)**PART C****Answer any 2 questions****Weights: 5**

19. Explain fast fourier transform and its advantages. Find the DFT of a sequence $x(n) = \{1,2,3,4,4,3,2,1\}$ using DIT algorithm (An, CO 2)
20. Explain how signals are classified according to their nature and characteristics in time domain. (An, CO 1)

21. Describe the elements of a signal processing system. Mention the advantages of digital signal processing. (An, CO 1)
22. Discuss with necessary theory, the design of IIR filters using approximation of derivatives and impulse invariant techniques. (An, CO 4)
- (5 x 2 = 10)**

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.
CO 1	To understand the basic idea in signals both analog and digital, and various techniques in basic DSP process.	U	2, 5, 7, 13, 14, 20, 21	17
CO 2	To understand the importance of transform in signal processing with special reference to DTFT and DFT	U	6, 9, 15, 18, 19	11
CO 3	To correlate DTFT to Z transform and understand the concept of poles, zeros and stability in digital signal processing.	U	1, 10, 11	4
CO 4	To understand various filters and realization in digital systems.	A	3, 4, 8, 16, 17, 22	12

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;