

QP CODE: 24044708



Reg No : .....

Name : .....

**M.Sc DEGREE (CSS) EXAMINATION, OCTOBER 2024**  
**Third Semester**  
**ELECTIVE - PH800301 - DIGITAL SIGNAL PROCESSING**

M.Sc PHYSICS  
2019 ADMISSION ONWARDS  
521ABC6F

Time: 3 Hours

Weightage: 30

**Part A (Short Answer Questions)**

*Answer any **eight** questions.*

*Weight 1 each.*

1. What is a signal? How these signals are classified according to their number of variables?
2. Find the sum of: (1)  $\sum_{n=-\infty}^{\infty} \delta(n-2) \sin 2n$   
(2)  $\sum_{n=-\infty}^5 \delta(n-3) \cos 2n + \delta(n-1) \sin 2n$
3. Find whether the system characterized by  $y(n) = x(n) + x(n-1)$  is time invariant.
4. Write the representation of an arbitrary sequence  $x(n)$  in terms of impulse sequence  $\delta(n)$ .
5. Show that there are only  $N$  independent harmonics for a discrete time Fourier series.
6. State and prove time reversal property of DFT
7. What are the desirable properties required for the conversion techniques to be effective, in the design of IIR filters from analog filters?
8. Write a short note on pre warping.
9. What do you understand by linear phase response?
10. What is meant by zero phase frequency response?

(8×1=8 weightage)

**Part B (Short Essay/Problems)**

*Answer any **six** questions.*

*Weight 2 each.*

11. Describe the mathematical model of continuous time systems.





12. Describe the block diagram of Digital Signal Processing system
13. Let  $x(n) = \{2, 4, 2, 6, 1, 3\}$  be a discrete time finite signal. Represent this signal in graphical form. Shift this signal by 2 units and represent the delayed and advanced versions of  $x(n)$ .
14. Briefly explain the development of DFT from DTFT.
15. Find the z transform and ROC of the sequence  $x(n) = \{-3, -2, -1, 0, 1\}$ .
16. Find the z transform and ROC of the causal sequence  $x(n) = \{1, -2, 1, 3, 4\}$ .
17. Realize the second order digital filter  $y(n) = 2r \cos(\omega_0) y(n-1) - r^2 y(n-2) + x(n) - r \cos(\omega_0) x(n-1)$  in direct-form I.
18. Realize  $y(n) + y(n+1) + 1/4 y(n-2) = x(n)$  in cascade form network.

(6×2=12 weightage)

### Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. Explain different types of correlations. Find the cross-correlation of the following finite length sequences  $x(n) = \{1, 2, 1, 1\}$  and  $y(n) = \{1, 1, 2, 1\}$ .
20. What is FFT? Explain the different stages of computation in 8-point DFT using Radix-2 DIT FFT?
21. Determine the pole zero plot for the system described by difference equation (1)  $y(n) - 3/4 y(n-1) + 1/8 y(n-2) = x(n) - x(n-1)$  (2)  $y(n) = 5/6 y(n-1) - 1/6 y(n-2) + x(n) - x(n-1)$
22. Explain approximation of derivative method in IIR filter design. Discuss the stability of the designed filter based on the mapping from s- plane to z- plane

(2×5=10 weightage)

