**QP CODE: 25022301**

25022301

**Reg No** : .....

**Name** : .....

## M.Sc DEGREE (CSS) SPECIAL REAPPEARANCE EXAMINATION, APRIL 2025

### Third Semester

M.Sc PHYSICS

### ELECTIVE - PH800301 - DIGITAL SIGNAL PROCESSING

2019 ADMISSION ONWARDS

E49125F4

Time: 3 Hours Weightage: 30

**Part A (Short Answer Questions)**

*Answer any **eight** questions.*

*Weight **1** each.*

1. *Differentiate between unit step function and unit ramp function in continuous time signals.*
2. *What are the different representations of discrete time signals?*
3. *Check whether the system characterized by $y(n) = n\,x^2(n)$ is linear or non-linear.*
4. *What is correlation of two signals? Explain the types of correlation.*
5. *Define the circular time shift property of DFT.*
6. *Draw the block diagram of three stages of computation in 8 point radix 2 FFT.*
7. *Give the steps in the design of digital filters from analogue filters.*
8. *Draw and explain the impulse invariant pole mapping.*
9. *What is warping effect? What is its effect on magnitude and phase response?*
10. *Draw the general realization structure in direct- form I of IIR system.*

(8×1=8 weightage)

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

*Answer any **six** questions.*

*Weight **2** each.*

11. *Describe the Aliasing effect with an example.*
12. *Describe the block diagram of Digital Signal Processing system.*
13. *What are the different classifications of discrete time signals? Explain each with examples.*
14. *Explain the relationship between DFT and Fourier transform.*

15. *Determine the z tranform and ROC of the signal $x(n) = a^n u(n)$*

16. *Find the z transform and ROC of the sequence x(n)= {3,2,-1,0,1,3↑)*

17. *Realize y(n)= 3/4 y(n-1) -1/8 y(n-2) + x(n) + 1/3 x(n-1) in cascade form.*

18. *Obtain the frequency response in the design of FIR filters using window technique.*

(6×2=12 weightage)

**Part C (Essay Type Questions)**

*Answer any **two** questions.*

*Weight **5** each.*

19. *Determine the convolution sum of sequences x(n)={3,2,1,2} and h(n) = {1,2 ↑ ,1,2}.*

20. *Derive the expression for the discrete time Fourier series of a discrete time signal x(n)..Show that the coefficients are periodic with period N.*

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)