QP CODE: 21000417

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Reg No : .....

Name : .....

M Sc DEGREE (CSS) EXAMINATION, MARCH 2021

Third Semester

Faculty of Science

M Sc PHYSICS

Elective - PH800301 - DIGITAL SIGNAL PROCESSING

2019 Admission Onwards

EE6FF21D

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. *Differentiate between deterministic and random signals.*
2. *Define a system. What are the different types of systems?*
3. *Differentiate between unit step function and unit ramp function in continuous time signals.*
4. *What is the shifting operation performed on discrete time signals ? Let x (n) be a discrete time signal,write the delayed and advanced versions of x (n) by 3 units of time.*
5. What is meant by frequency spectrum of DFT?
6. Define FFT. What are the advantages of FFT compared to DFT?
7. Why IIR filters don't have linear phase?
8. If the impulse response of a filter is h(n), then give (a) the condition for it to be realizable (b) the condition for it to be stable (c) give the form of transfer function for IIR filter using h(n).
9. How many number of addition, multiplication and memory location is required for to realize a system H(z) having M zeros and N poles in (a) direct- form I realization and (b) direct- form II realization
10. Determine the frequency response of FIR filter defined by y(n) = 0.25 x(n) + x(n-1) + 0.25 x(n-2).Calculate the phase delay and group delay.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Describe the block diagram of Digital Signal Processing system

12. *Distinguish between time variant and time-invariant systems.Test whether the following systems are time variant or time-invariant.* *(i) $y(n) = x(-n)$. (ii) $y(n) = n\,x^2(n)$*

13. *Write the steps for the computation of correlation.Write two applications of the concept of correlation in signal processing.*

14. Define and prove circular time shift and circular frequency shift of DFT.

15. *Find the Z transform of the sequence $x(n) = \{3,1,2,5^{\uparrow},7,0,1\}$*

16. Find the stability of system whose implse response $h(n) = (1/2)^n u(n)$.

17. Apply bilinear transformation to $H(s) = 2 / \{(s+1)(s+2)\}$ with T=1 sec and find H(z)

18. Show that when the impulse response is antisymmetrical,FIR filters will have only constant group delay.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. *How signals are classified? Illustrate the elementary discrete time signals and sketch their forms.*

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. Prove any five properties of z transform.

22. Explain the cascade form realization of IIR filters.For the system function $H(z) = (1 + 2z^{-1} + z^{-2}) / (1 - 3/4\, z^{-1} + 1/8\, z^{-2})$ obtain the cascade form..

(2×5=10 weightage)