

QP CODE: 22000735



Reg No :

Name :

M Sc DEGREE (CSS) EXAMINATION, APRIL 2022

Third Semester

Faculty of Science

M Sc PHYSICS

Elective - PH800301 - DIGITAL SIGNAL PROCESSING

2019 ADMISSION ONWARDS

424277A2

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

Answer any **eight** questions.

Weight **1** each.

1. Define signal processing. Write any two advantages and disadvantages of Digital Signal Processing.
2. Define a discrete time signal. How these signals are classified into symmetric and anti-symmetric?
3. Test whether the following systems are causal or noncausal. (1) $y(n) = A x(n) + B$ (2) $y(n) = x(n^2)$
4. Write and explain the convolution sum of two signals.
5. Prove that discrete time exponential signal whose frequencies are integral multiple of 2π are identical.
6. Explain why FFT is needed?
7. What are the properties that are maintained same in the transfer of analogue filter into digital filter?
8. An IIR system with system function $H(z) = H_1(z) H_2(z)$ is given. Realize it in direct form II. cascade form.
9. Draw the frequency response of N point rectangular window.
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 elementary continuous time signals.





12. Draw a finite discrete time signal in graphical form. Express it in other possible representations. Also draw the delayed and time-reversed form of the signal.
13. Explain the correlation of power and periodic signals.
14. Prove that DFT of a product of two discrete time sequence is equivalent to the circular convolution of the DFTs of the individual sequences scaled by a factor of $1/N$.
15. Find the z transform and the ROC of the signal $x(n) = -b^n u(-n-1)$
16. Find the z transform and ROC of the sequence $x(n) = \{3, 2, -1, 0, 1, 3\}$
17. Compare an analog filter and a digital filter. Write three points about the advantages of digital filter.
18. Obtain the direct form II realization for the system described by the difference equation $y(n) + y(n-1) - 4y(n-3) = x(n) + 3x(n-2)$

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. Sketch the signal $x(t) = \sin 7t + \sin 10t$ for an interval $0 \leq t \leq 2$. Sample the signal with a sampling period $T = 0.2$ second sketch the discrete time signal.
20. Prove the periodicity, symmetry properties of twiddle factor. Explain zero padding. What is meant by time domain aliasing due to frequency sampling?
21. Determine the pole zero plot for the system described by difference equation (1) $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) - x(n-1)$ (2) $y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n) - x(n-1)$
22. Explain the impulse invariant method for IIR filter design. Discuss the aliasing problem based on the mapping from s- plane to z- plane.

(2×5=10 weightage)

