INTEGRATED MSC DEGREE EXAMINATION, JUNE 2024

Fifth Semester

INTEGRATED MSC BASIC SCIENCE-STATISTICS

CORE - IST5CR03 - NUMERICAL ANALYSIS

2020 Admission Onwards

C1828A30

Time: 3 Hours   Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Define the formula associated with Aitken's Δ^2 process.

2. State the convergence condition for Newton-Raphson formula.

3. Which method is used to find the smallest root of $f(x) = 0$? Explain briefly.

4. What do you mean by interpolation?

5. Give the formula for second backward differences for n=2.

6. Briefly explain central difference operator.

7. What do you mean by inverse Fourier transform?

8. What does power density spectrum refers to?

9. Give the Stirling's formula for finding second order derivative.

10. Explain about any rule or formula for evaluating numerical integration.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Explain the procedure of bisection method.

12. Solve the equation $xe^x = 3$ for a positive root in between 1 and 2 by false position method (upto 4 iterations).

13. Use the method of iteration to find , correct to 4 significant figures, a real root of the equation $x = 1/(x+1)^2$, taking first approximation as 1 (upto 4 iterations).

14. Set up a forward difference table of $f(x) = x^2$ for x= 0(1)10

15. Show that: $\Delta^3 y_2 = \nabla^3 y_5$

16. Using matrix representation, find the DFT of the sequence f_k = {0,1, 0, -1}.

17. Evaluate $I = \int_0^1 \frac{1}{1+x} dx$ correct to 3 decimal places by trapezoidal rule with h = 0.5.

18. A solid of revolution is formed by rotating about the x-axis the area between the x-axis, the lines x = 0 and x = 1, and the curve through the points with the following coordinates:

x	0	0.25	0.5	0.75	1
y^2	1	0.9793	0.9195	0.8261	0.7081

Estimate the volume of the solid formed using Simpson's 1/3rd rule.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. i) Describe the procedure of generalized Newton's method.

ii) Use generalized Newton's method to find a double root of the equation $f(x) = x^3-x^2-x+1 = 0$, choosing first approximation as 0.8 .

20. Using Newton's forward difference formula, find the sum $S_n = 1^3 + 2^3 + 3^3 +.... + n^3$.

21. i) Briefly explain Fourier series.

ii) Obtain the graph and the Fourier series of the function defined by :

$$f(t) = \begin{cases} -1 ; & -\pi < t < 0 \\ 0 ; & t = 0 \\ 1 ; 0 < t < \pi \end{cases}$$

22. i) Derive Simpson's 3/8th rule.

ii) Using this evaluate $\int_0^1 \frac{1}{(1+x)} dx$ with h = 1/6.

(2×5=10 weightage)