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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2022 ONLY)

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REG.NO

NGM COLLEGE (AUTONOMOUS) POLLACHI

END-OF-SEMESTER EXAMINATIONS: DECEMBER- 2022

B. Sc Computer Science with data Analytics **MAXIMUM MARKS: 50**

I SEMESTER **TIME: 3 HOURS**

PART - III

MATHEMATICAL FOUNDATION FOR DATA SCIENCE

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. If $f(x) = x^3 - x$ then $f'(x) =$ _____
   a) $3x^2 - 1$ b) $3x^2 - x$
   c) $3x^2 - 3$ d) $x^2 - 1$
2. In the Integral $\int_a^b f(x)dx$, a is called _____
   a) Integral sign b) Sample point
   c) Lower Limit d) Upper Limit
3. Which of the following method is said to be direct method?
   a) Gauss Jacobi b) Gauss Elimination
   c) Gauss Seidel d) Newton method
4. Interpolation formulae are based on the fundamental assumption that the data can be expressed as _____
   a) A Linear function b) A quadratic function
   c) Even function d) A polynomial function
5. Number of sub intervals for Trapezoidal rule is _____
   a) any b) even c) multiples of 3 d) multiples of 6

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES (K2)

6. If $y = f(x)$ then what is the condition for maximum, minimum of $f(x)$?
7. Define Integration.
8. Define diagonally dominant property.
9. Define Interpolation.
10. What is the truncation error in Simpson's one-third rule?

SECTION – B (5 X 3 = 15 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(Qn. No. 11 to 15 Questions for Short Answers with internal choices) (K3)

11. a) Find $f'(x)$ if $f(x) = \frac{1-x}{2+x}$.

(OR)

b) Find the absolute maximum and minimum values of the function $f(x) = x^3 - 3x^2 + 1$.

12. a) Evaluate $\int_0^3 (x^3 - 6x)\, dx$, taking the sample points to be right endpoints and a = 0, b =3, and n = 6.

(OR)

b) Use the Midpoint Rule with n = 5 to approximate $\int_1^2 \frac{1}{x}\, dx$.

13. a) Solve the equations 2x+3y = 5 and 3x-y = 2 by Gauss Elimination method.

(OR)

b) Solve the equations x+y = 2 and 2x+3y = 5 by Gauss Jordan method.

14. a) Find a cubic polynomial which takes the following values.

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x	0	1	2	3
f(x)	1	2	1	10

(OR)

b) Find f(9) using Newton's forward interpolation formula.

x	8	10	12	14	16
f(x)	1000	1900	3250	5400	8950

15. a) Evaluate $\int_0^{\frac{\pi}{2}} \sin x\, dx$ by Simpson's one-third rule dividing the range with $h = \frac{\pi}{12}$.

(OR)

b) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by dividing the range into 3 equal parts using Trapezoidal rule.

SECTION – C (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(Qn. No. 16 to 20 Questions for Long Answers with internal choices (K4 (Or) K5)

16. a) A cylindrical can is to be made to hold 1 L of oil. Find the dimensions that will minimize the cost of the metal to manufacture the can.

(OR)

b) If $f(x) = x^3 - x$ then find $f'''(x)$ and $f^4(x)$.

17. a) Find the area of the region enclosed by the parabolas $y = x^2$ and $y = 2x - x^2$.

(OR)

b) Find the volume of the solid obtained by rotating the region bounded by $y = x^3$, y = 8, and x=0 about the y-axis.

(CONTD….3)

ETHICAL PAPER

18. a) Solve the equations x+y+z = 9, 2x-3y+4z = 13 and 3x+4y+5z = 40 by Gauss Jordan method.

(OR)

b)) Solve the equations 2x+y = 3 and 2x+3y = 5 by Gauss Seidel Iteration method.

19. a) Find the missing term.

x	2	4	6	8	10
f(x)	7	-	15	19	23

(OR)

b) Find f(2.65) using Newton's backward interpolation formula.

x	-1	0	1	2	3
f(x)	-21	6	15	12	3

20. a) Evaluate $\int_0^1 \frac{1}{1+x}dx$ by using Simpson's three-eight rule.

(OR)

b) Find $\frac{dy}{dx}$ at x = 51 from the following data.

x	50	60	70	80	90
y	19.96	36.65	58.81	77.21	94.61

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