

Regd. No: \_\_\_\_\_

**4384/ STA M-4304**

**B.SC (DATA SC) (Honours) U.G Examinations-19 APRIL 2025**

*SEMESTER-IV (REGULAR)*

(Admitted Batch 2023-24 Only)

**DESIGN AND ANALYSIS OF EXPERIMENTS**

TIME: 3 Hrs

Max. Marks:60

Pass Marks:24

**SECTION – A**

Answer any **Five** of the following Questions.

5 x 4M = 20M

1. Define ANOVA and give the assumptions for ANOVA test.
2. Write the mathematical model of two-way classification and its ANOVA table.
3. Define Treatments, Blocks, and Experimental error.
4. Write the advantages and disadvantages of CRD.
5. Define RBD and give its layout.
6. Write the advantages and disadvantages of RBD.
7. Define LSD and give its layout.
8. Explain the missing plot technique in LSD.
9. Explain about factorial experiments and give their advantages.
10. Explain the main and interaction effects in  $2^2$  factorial design.

**SECTION – B**

Answer **ALL** the following Questions.

5 x 8M = 40 M

11. Explain the complete analysis of One-way classification.

OR

12. Explain the analysis of variance of Two-way classification.

13. Explain the principles of design of experiments along with their uses.

OR

14. Define CRD and explain the statistical analysis of CRD.

15. Write the advantages and disadvantages of RBD. Explain the statistical analysis of RBD.

OR

16. Explain the missing plot technique in RBD along with its statistical analysis.

17. Define LSD and explain the statistical analysis of LSD.

OR

18. Explain the efficiency of LSD over RBD when rows are taken as blocks.

19. Explain the statistical analysis of  $2^2$  factorial design.

OR

20. Explain the Yate's method of computing the factorial effect totals.

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**B.SC (DATA SC) (Honours) U.G Examinations-22 APRIL 2025**

SEMESTER-IV (REGULAR)

(Admitted Batch 2023-24 Only)

**NUMERICAL ANALYSIS**

TIME: 3 Hrs

Max. Marks:60

Pass Marks:24

**PART- A**

**Answer Any Five Of The Following.**

**5 X 4 = 20 M**

1. Define the forward, backward, central and shift operators.
2. Show that  $\Delta^n(e^{ax+b}) = e^{ax+b}(e^a - 1)^n$
3. Define interpolation and extrapolation.
4. Show that  $n^{\text{th}}$  order divided difference of an  $n^{\text{th}}$  degree polynomial is a constant.
5. Explain the concept of divided differences and write the properties of divided differences.
6. Write the formulae of Lagrange's interpolation and inverse interpolation.
7. Define Numerical differentiation.
8. Write the formulae of first and second derivatives using Sterling's formula.
9. Define Newton-Cote's general quadrature formula.
10. Write the formulae of Simpson's  $1/3^{\text{rd}}$  rule  $3/8^{\text{th}}$  rule.

**PART- B**

**Answer All The Following Questions.**

**5 x 8 = 40 M**

11. Construct a forward difference table from the following data and find  $\Delta^2 y_2$  and  $\Delta^3 y_1$ .

X	0	1	2	3	4
Y	1	1.5	2.2	3.1	4.6

**OR**

12. Prove the following.

(i)  $\Delta \log f(x) = \log \left[ 1 + \frac{\Delta f(x)}{f(x)} \right]$

(ii)  $e^x = \frac{\Delta^2}{E} e^x \frac{E e^x}{\Delta^2 e^x}$

13. State and prove Newton's forward interpolation formula.

**OR**

14. Use Gauss backward interpolation formula to find  $f(32)$ , given that  $f(25) = 0.2707$ ,  $f(30) = 0.3027$ ,  $f(35) = 0.3386$  and  $f(40) = 0.3794$ .

15. State and prove Lagrange's interpolation formula.

**OR**

16. Find the values of  $f(8)$  and  $f(12)$  by using Newton's divided difference formula from the following data.

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

17. Calculate the first and second derivatives of Y at X = 1.5 from the following table:

X	1.5	2.0	2.5	3.0	3.5	4.0
Y	3.375	7.0	13.625	24.0	38.875	59.0

**OR**

18. The distance travelled by a vehicle at various time intervals during the initial running are given below.

Time (in Sec.)	5	6	7	8	9
Distance (in KM)	10	14.5	19.5	25.5	32

Find the velocity and acceleration of the vehicle at the time of 7 seconds using Sterling's formula.

19. A rocket is launched from the ground and its acceleration is registered during the first 80 seconds and is given in the following table. Using Simpson's  $1/3^{\text{rd}}$  rule, find the velocity of the rocket at  $t = 80$  seconds.

Time (Seconds)	0	10	20	30	40	50	60	70	80
Velocity (cm/sec <sup>2</sup> )	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

**OR**

20. Evaluate  $\int_0^6 \frac{1}{1+x} dx$  by using

(i) Trapezoidal rule

(ii) Simpson's  $3/8^{\text{th}}$  rule