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**Reg. No. : .....**

**Name : .....**

**Second Semester M.Sc. Degree Examination, August 2025**

**Statistics**

**ST 523 : APPLIED STATISTICS AND NUMERICAL METHODS**

**(2021 Admission Onwards)**

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **any four** questions. **Each** question carries **3** marks.

1. What does NSSO stand for and what is its role within the Indian statistical system?
2. Explore the use of simple aggregate methods for calculating index numbers.
3. Analyze the characteristics and applications of Dorbish-Bowley index numbers.
4. Define crude death rate and explain its relevance in population analysis.
5. What is a mortality table, and how is it constructed?
6. Describe the Newton-Raphson method and its advantages in solving nonlinear equations.
7. Discuss the Euler method for numerically solving ordinary differential equations and provide an example.
8. Describe the forward difference method for numerical differentiation and provide an example.

**(4 × 3 = 12 Marks)**

P.T.O.

## SECTION – B

Answer **any three** questions. **Each** question carries **8** marks.

9. Explain the features and differences between Paasche's and Laspeyre's index numbers.

10. (a) Explain the role of the NSSO in estimating poverty and measuring income inequality in India.

    (b) How does the CSO contribute to the development of statistical databases and information systems in the country?

11. (a) Describe the computation process and significance of consumer price index numbers.

    (b) Explain the criteria used to determine a good index number.

12. Analyze the implications of a high crude birth rate on a population's growth and development.

13. Discuss the challenges in collecting and analyzing mortality data in developing countries.

14. Explain the applications of mortality tables in life insurance and pension planning.

**(3 × 8 = 24 Marks)**

## SECTION – C

Answer **any three** questions. **Each** question carries **8** marks.

15. Describe the Lagrange interpolation formula and its implementation in finding polynomial approximations.

16. (a) How does the method of iteration help in solving transcendental equations?

    (b) Discuss the steps involved in applying the Newton-Raphson method to solve algebraic equations.

17. Solve the equation $2x^3 - 5x^2 + 3x - 1 = 0$ using the Newton-Raphson method. Use an initial guess of $x = 1$.

18. Compare and contrast the Euler method, modified Euler method, and Runge-Kutta methods in terms of accuracy and computational complexity.

19. Approximate the integral of the function $f(x) = x\text{^}2 + 3x + 2$ from $x = 1$ to $x = 5$ using the trapezoidal rule with a step size of $h = 0.5$.

20. Solve the initial value problem $dy / dx = x - y$, $y(0) = 1$ using the fourth-order Runge-Kutta method. Approximate the solution at x = 0.5 with a step size of $h = 0.1$.

**(3 × 8 = 24 Marks)**

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**Reg. No. : .....**

**Name : .....**

**Second Semester M.Sc. Degree Examination, September 2024**

**Statistics**

**ST 523 : APPLIED STATISTICS AND NUMERICAL METHODS**

**(2021 Admission Onwards)**

Time : 3 Hours Max. Marks : 60

PART – A

Answer any **four** questions. Each question carries **3** marks.

1. What is the Indian statistical system and what is its purpose?
2. Explore the usage and significance of Kelly's index numbers.
3. Explore the concept of base shifting in relation to index numbers.
4. What are vital statistics and why are they important in demographic analysis?
5. How is mortality measured, and what are the key indicators used?
6. What are the conditions required for the Newton-Raphson method to be successful in finding solutions?
7. Explain the concept of numerical differentiation and its importance in approximating derivatives.
8. What are the advantages of the modified Euler method compared to the Euler method?

**(4 × 3 = 12 Marks)**

**P.T.O.**

## PART – B

Answer any **three** questions. Each question carries **8** marks.

9. (a) Discuss the role of relative importance in constructing index numbers.

   (b) Analyze the limitations associated with the use of index numbers.

10. Discuss the future challenges and opportunities for the Indian statistical system in the era of data-driven decision-making.

11. (a) Discuss the significance of selecting a representative base period in index numbers.

   (b) Explain the role of index numbers in adjusting wages and salaries.

12. Discuss the limitations and potential biases in vital statistics data collection and analysis.

13. How is the total fertility rate calculated, and what does it indicate about a population's fertility level?

14. What is the gross reproduction rate, and what information does it provide about population replacement?

**($3 \times 8 = 24$ Marks)**

## PART – C

Answer any **three** questions. Each question carries **8** marks.

15. Discuss the Hermite interpolation method and its applications in solving algebraic equations.

16. What is Lagrange interpolation, and how is it used to approximate functions?

17. Solve the equation $e^x - 3x = 0$ using the method of iteration. Use an initial guess of $x = 1$.

18. Explain the concept of step size and its impact on the accuracy of numerical solutions of differential equations.

19. (a) Explain the concept of adaptive step size control in numerical solutions of differential equations.

   (b) Discuss the role of numerical methods in simulating and modeling dynamic systems.

20. Approximate the derivative of the function $f(x) = x^3 - 2x^2 + x$ at $x = 2$ using the forward difference method with a step size of $h = 0.1$.

**($3 \times 8 = 24$ Marks)**

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(Pages : 3) **R – 7463**

**Reg. No. : .....**

**Name : .....**

**Second Semester M.Sc. Degree Examination, November 2023**

**Statistics**

**ST 523 : APPLIED STATISTICS AND NUMERICAL METHODS**

**(2021 Admission onwards)**

Time : 3 Hours Max. Marks : 60

PART – A

Answer **any four** questions. Each question carries **3** marks.

1. What is the difference between chain base index and fixed base index?

2. Explain splicing and deflating of index numbers.

3. Why is an abridged life table prepared?

4. Define crude birth rate and general fertility rate.

5. Explain forward and backward differences.

6. Explain interpolation and write down Spline Interpolation formula.

7. Explain modified Euler's method.

8. Explain the iteration method to find the roots of an equation.

**($4 \times 3 = 12$ Marks)**

**P.T.O.**

## PART – B

Answer **any three** questions. Each question carries **8** marks.

9. Explain factor reversal test and time reversal test. Show that Fishers Ideal index number satisfies both these tests.

10. Explain the role and responsibilities of RGI.

11. What is consumer price index number? Explain how consumer price index numbers are constructed.

12. Explain the purpose and procedure for standardizing death rates.

13. Explain the meaning of the following rates in Vital statistics and discus their importance.

    (a) Crude death rate

    (b) Standard birth rate

    (c) Central mortality rate

14. What do you understand by the term 'vital statistics'? Explain its various uses.

**(3 × 8 = 24 Marks)**

## PART – C

Answer **any three** questions. Each question carries **8** marks.

15. Explain Newton Raphson method. Using this, find a root of the equation, $x^3 - 2x - 5 = 0$.

16. Explain the steps in Lagrange's interpolation method. Give one example.

17. Explain Hermite's interpolation. Give its importance.

18. Using Picard's method, find $y(0.1)$, given that $\frac{dy}{dx} = \frac{y - x}{y + x}$ and $y(0) = 1$.

19. Explain Euler's method of successive approximations for solving a first order differential equations.

20. Given $y' = y - x$, where $y(0) = 2$, find $y(0.1)$ and $y(0.2)$ using Runge Kutta method correct to four decimal places taking step size 0.1.

**($3 \times 8 = 24$ Marks)**

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(Pages : 3) **P – 5258**

**Reg. No. : .....**

**Name : .....**

**Second Semester M.Sc. Degree Examination, September 2022**

**Statistics**

**ST 523 – APPLIED STATISTICS AND NUMERICAL METHODS**

**(2021 Admission)**

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **any four** questions. **Each** question carries **3** marks.

1. What do you mean by base shifting and splicing of index numbers?

2. Explain the divisions of CSO and their functions.

3. Distinguish between stationary and stable population.

4. What is the difference between gross reproduction rate and net reproduction rate?

5. Explain finite difference method.

6. Give Hermite's interpolation formula. What is it's importance?

7. What is modified Euler method?

8. Explain the iteration method to find the roots of an equation?

**($4 \times 3 = 12$ Marks)**

**P.T.O.**

## SECTION – B

Answer **any three** questions. **Each** question carries **8** marks.

9. What is consumer price index? Describe the steps to construct the consumer price index.

10. Explain the different problems in construction of index numbers and the limitations of index numbers.

11. Explain the role and responsibilities of NSSO.

12. Define and compare various measures of fertility.

13. What is an abridged life table? Explain the various columns in an abridged life table and indicate the relationships that exist among them.

14. Explain the different indices of mortality.

**($3 \times 8 = 24$ Marks)**

## SECTION – C

Answer **any three** questions. **Each** question carries **8** marks.

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

16. Given the set of data points (1, –8), (2, –1) and (3, 18) satisfying the function $y = f(x)$. find the linear splines satisfying the given data. Determine the approximate values of $y(2.5)$ and $y'(2.0)$.

17. How do you solve a Lagrange interpolation polynomial?

18. Given the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2 + 1}$, with the initial condition $y = 0$, when $x = 0$, use Picard's method to obtain $y$ for $x = 0.25, 0.5$ and 1, correct to three decimal places.

19. Determine the value of $y$ when $x$ = 0.1, give that $y(0) = 1, y' = x^2 + y$ by Euler's method with step size $h$ = 0.05.

20. Explain Runge Kutta method of successive approximations for solving a first order differential equations.

**($3 \times 8 = 24$ Marks)**

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