

**2019**

**MSc**

**2<sup>nd</sup> Semester Examination**

**APPLIED MATHEMATICS WITH OCEANOLOGY AND  
COMPUTER PROGRAMMING**

**PAPER – MTM-204 (CBCS)**

**Full Marks : 50**

**Time : 2 Hours**

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

## (Statistical and Numerical Methods)

1. Answer any **FOUR** questions:

4x2

- Define truncation error.
- If  $f(x) = 4 \cos x - 6x$ , find the relative percentage error in  $f(x)$  for  $x=0$ , when error in  $x$  is 0.005.
- Define regression equation and regression curve for set of bivariate data.
- Find the median of 33, 86, 68, 32, 80, 48, 70, 64.
- Find the position of a positive real root of  $x^2 - 2x - 2 = 0$ .
- Are the two lines  $2x + 3y = 7$  and  $3y - 7x = 2$  regression lines? Give reasons.
- Give physical significance of the correlation co-efficient.
- Define null hypothesis.

2. Answer any **FOUR** questions:

4x4

a) The values of function  $f(x)$  are given for certain values of  $x$ :

$x$ :	20	25	30	35	40
$f(x)$ :	30.5	34.5	40	47.75	59.25

Estimate the value of  $f(x)$  for  $x=24$ , correct to three decimal places.b) Compute  $f(x)$  from the following table:

$x$ :	-1	0	2	5
$f(x)$ :	9	5	3	15

- Find the value of  $\int_1^2 \frac{dx}{x}$  by Trapezoidal rule by taking 4 equal subintervals.
- Explain the bisection method for computing a real root of an equation  $f(x)=0$ .
- Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  by Simpson's 1/3 rule by taking 6 equal subintervals.
- Solve by Gauss-elimination method, correct up to two significant figures.

$$8x + 2y - 2z = 8$$

$$x - 8y + 3z = -4$$

$$2x + y + 9z = 12$$

- g) Find  $y(0.15)$ , from the equation  $\frac{dy}{dx} = x^2 + y^2$ ,  $y(0) = 0$ , taking step length  $h = 0.05$ , by Euler's method, correct up to four decimal places.
- h) If two variables  $x$  and  $y$  satisfy the relation  $y = -5 + 6x$ , find the correlation coefficient between  $x$  and  $y$ .

3. Answer any **TWO** questions:

2x8

- a) Describes Newton-Raphson method to find a real root of the equation  $f(x) = 0$ , Where  $f(x)$  is continuous function of  $x$ . Give the geometrical interpretation of this method. Write the convergence criteria of this method.
- b) Compute  $y(0.3)$ , from the equation  $\frac{dy}{dx} = x - y$ ,  $y(0) = 1$ , taking step length  $h = 0.1$ , by fourth order Runge-Kutta method, correct up to five decimal places.
- c) Deduce the equation of regression lines for a set of  $n$  bivariate data. Prove that Correlation coefficient of two variables is the geometric mean of the two regression coefficient.
- d) Describe Chi-square distribution and Student's  $t$ -distribution.

[ Internal Assessment: 10 Marks ]