

**PG (NEW) CBCS**  
**M.Sc. Semester-II Examination, 2019**  
**APPLIED MATHEMATICS WITH OCEANOLOGY AND**  
**COMPUTER PROGRAMMING**  
**PAPER: C-MTM 204A**  
**ELECTIVE(CBCS)**  
**STATISTICAL AND NUMERICAL METHODS**

**Full Marks: 40****Time: 2 Hours****1. Answer any four questions of the following: 2×4**

- a) What is transcendental equation, give an example.?  
 b) Find the value of x for which  $f(x) = 0$ , where  $f(x)$  is given in the table

x	-1	-2	2
f(x)	-1	-9	11

- c) A point P is chosen at random on a line segment AB of length 2a. Calculate the expected values of the rectangle  $AP \cdot PB$  and the difference  $|AP - PB|$ .  
 d) Locate the real root of the equation  $f(x) \equiv x^3 - 8x + 5 = 0$   
 e) If  $y = 3x^7 - 6x$ , find the percentage error in y at  $x = 1$  if the error in x = 0.05.  
 f) Are these two lines  $2x + 3y = 7$  and  $3y - 7x = 2$  as the regression lines? Give reasons.  
 g) Write the physical significance of the correlation co-efficient.  
 h) Define null hypothesis.

**2. Answer any four questions of the following: 4×4**

- a) The number of petals was counted for 22 flowers of a certain species with the following results:

4    4    7    5    4    4    4    5    6    5    6  
 9    4    4    4    4    5    6    4    5    4    4

(Turn over)

(2)

Draw up a frequency table, and find the mean, median and mode of the sample.

- b) Use Newton-Raphson method to evaluate the smallest root of  $e^x - 3x = 0$ . Correct to three significant figures.
- c) Use Simpson's one-third rule to evaluate  $\int_0^6 \frac{dx}{(1+x)^2}$  taking six equal subintervals of  $[0, 6]$ , correct to 2 decimal places.
- d) Explain the bisection method by which the real root of an equation are determined.
- e) The values of function  $f(x)$  are given for certain values of  $x$ :

$x$ :	0	0.1	0.2	0.3	0.4
$f(x)$ :	1	1.095	1.179	1.251	1.310

- f) Find the value of  $\int_0^5 \frac{dx}{1+x}$  by trapezoidal rule, taking step length  $h = 1$ .
- g) Solve by Gauss-elimination method. Correct up to two significant figures.
- $$x + 2y + 3z = 10$$
- $$x + 3y - 2z = 7$$
- $$2x - y + z = 5$$
- h) Find  $y(0.02)$ , from the equation  $\frac{dy}{dx} = x^3 + y$ ,  $y(0) = 1$ , taking step length  $h = 0.01$ , by Euler's method, correct up to four decimal places.

**3. Answer any two questions of the following:**

**2×8**

- a) Fit a straight line (a)  $y = C_0 + C_1x$  and parabolas (b)  $y = C_0 + C_1x + C_2x^2$  and  $y = C_0 + C_2x^2$  to the following data, and compare their goodness fit.

$x$	3.5	8.4	16.8	23.9	27.1	28.8
$y$	4.4	9.2	20.6	31.1	35.0	37.7

(Turn over)

(3)

- b) A die was thrown 1000 times and the frequencies of the different faces were observed to be the following:

Face	1	2	3	4	5	6	Total
Frequency	105	143	181	157	198	216	1000

Test if the die is honest.

- c) Describes Newton-Raphson method to find a real root of the equation  $f(x) = 0$ , where  $f(x)$  is continuous function of  $x$ . Give geometrically interpretation of this method.
- d) Compute  $y(0.6)$ , from the equation  $\frac{dy}{dx} = xy, y(0) = 2$ , taking step length  $h = 0.2$ , by fourth order Runge-Kutta method, correct up to five decimal places.

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