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Paper Code : OEC-IT601A Numerical Methods

UPID : 006587

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer *any ten* of the following : [1 x 10 = 10]

(I) The method which always converges to the root of equation f(x) = 0 is _____

(II) The solution of the differential equation $\frac{dy}{dx} = xy, y(1) = 5$ in [1, 1.5], where h = 0.1 is_____

(III) Round off the number 979.267 correct to four significant figures.....

(IV) If $f(x) = \frac{1}{x^2}$, then find the divided difference f(a,b) is.....

(V) In the Trapezoidal rule for finding the value of $\int_a^b f(x)dx$ there exists no error if $f(x)$_____function.

(VI) The system of equations AX = B are non-homogeneous if B equals to (a) 0 (b) x (c) y (d) None

(VII) Newton's Rapson's method converges if_____

(VIII) If $\frac{dy}{dx} = y^2 - x^2, y(0) = 1$ then $y(0.5) =$_____

(IX) Inherent error is also known as.....

(X) If $f(0) = 12, f(3) = 6 and f(4) = 8$, then the linear interpolation function f(x) is.....

(XI) Integrate $\int_0^4 x^2 dx$ by Simpson's 1/3rd rule with 4 sub-intervals.

(XII) In LU decomposition method, the diagonal element in U are all_____

Group-B (Short Answer Type Question)

Answer *any three* of the following : [5 x 3 = 15]

2. What is mean by diagonally dominant matrix? Explain [5]
3. Find a positive value of $\sqrt[3]{17}$ correct to four decimal places by the Newton-Raphson method. [5]
4. Using Euler's method, compute y(0.5) for the given differential equation is $y' = y^2 - x^2, y(0) = 1$ [5]
5. Calculate the relative error in the computation of x-y for x = 3.21, y = 2.12 having absolute errors $\triangle x = 0.003$ and $\triangle y = 0.001$ [5]
6. Evaluate $\int_0^3 \sqrt{x}\, dx$ using the Trapezoidal rule, taking n = 3. [5]

Group-C (Long Answer Type Question)

Answer *any three* of the following : [15 x 3 = 45]

7. (a) Using the bisection method to obtain the smallest positive root of the equation $x^3 - 5x + 1 = 0$ [7]
   (b) Find the smallest positive root of the equation $x - e^x = 0$ using false position method [8]
8. (a) What is the finite difference method? [5]
   (b) Find the solution of $y' = x + y, y(0) = 0 for, 0.4 \le x \le 1.0$ with h = 0.1 by the Predictor-Corrector Method. [10]
9. (a) Find the error in calculating the area of a circle of radius 5 when an error in radius is 0.1 [5]
   (b) If u = $\frac{3xy}{z^2} = f(x,y,z)$. Find the maximum relative error. [5]
   (c) Suppose that you have a task of measuring the length of a bridge and a river and come up 9999 and 9 cm respectively. If the true value is 10000 and 10 cm respectively. Compute the percentage error in each case. [5]
10. (a) State Lagrange's interpolation formula and also write down the disadvantages. [7]

(b) Find the polynomial of degree ≤ 3 passing through the points (-1, 1), (0, 1), (1, 1) and (2, -3). [8]

11. (a) Find the equation of the cubic curve which passes through the points (4, -43), (7, 83), (9, 327) and (12, 1053). Hence find f(10) [7]

(b) The population of a city for five censuses is given below: [8]

Year:	1941	1951	1961	1971	1981	1991
Population: (In lacs)	46.52	66.23	81.01	93.70	101.58	120.92

Using a suitable formula estimate the population of the city for the year 1985.

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