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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) How many predictor and corrector steps does the fourth-order Runge-Kutta method use ?

(II) Distinguish between Round off error and Truncation error.

(III) If y = f(x) are known only at (n+1) distinct interpolating points, then what is the LaGrange polynomial degree.

(IV) The degree of precision of Trapezoidal rule is.

(V) When do you call a System of Linear Equation AX = B to be Consistent?

(VI) Find a root of the equation $x^2 - 2x - 5 = 0$ by Newton – Raphson method.

(VII) If 5/3 is approximated to 1.6667, then absolute error is

(VIII) Find Newton's backward difference interpolation polynomial against the tabulated values:

x:	3	4	5	6
f(x):	6	24	60	120

(IX) THe degree of precision of Weddle's rule is

(X) What is the principle of LU factorization method ?

(XI) Find the forward interpolation polynomial for the function f(x) where f(0) = -1,f(1) = 1 ,f(2) = 1 and f(3) = -2.

(XII) Simpson's one third rule is applicable only if the number of sub-interval is

Group-B (Short Answer Type Question)

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

2. Find the missing term from the following Interpolation table. [5]

x	F(x)
2	45
3	49.2
4	54.1
5	?
6	67.4

3. Evaluate $\int_{0.1}^{0.8}(e^x + 2x)dx$ by Trapezoidal Rule taking h=0.1, correct up to 5-decimal places. [5]

4. Using following data, find the value of y at x = 5 by the Newton's forwaed interpolation polynomial. [5]

X	0	10	20	30	40
Y	7	18	32	48	85

5. Solve the following equation by LU Decomposition methods: [5]

$$x+y+z=1,$$
$$4x+3y-z=6,$$
$$3x+5y+3z=4.$$

6. Using Newton's backward interpolation formula, find the annual premium at the age of 33 from the following data [5]

Age in years (x):	24	28	32	36	40
Annual premium(y):	28.06	30.19	32.75	34.94	40

Group-C (Long Answer Type Question)

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

7. (a) [7]

Evaluate $\int_0^1 x^3 dx$, by Trapezoidal Rule, with n = 5.

(b) Evaluate $\int_0^{\pi/2} \sqrt{1-0.162sin^2\varphi}\, d\varphi$, by Simpson's One Third Rule, correct up to two decimal places. [8]

8. (a) Find y(0.10) and y(0.15), by Euler's Method, from the differential equation, $\frac{dy}{dx} = x^2 + y^2$, [7]

y(0) = 0, correct upto four decimal places, taking step length h = 0.05.

(b) Solve by Euler's modified method the following differential equation for x = 0.02, by taking step length h = 0.01, [8]

$\frac{dy}{dx} = x^2 + y$, y = 1 when x = 0.

9. (a) Using Lagrange Interpolation find the value of y at x=8 Given y(0) = 18, y(1) = 42, y(7) = 57 and y(9) =90 ? [8]

(b) Compute the value of f(7.5) from the following table [7]

x:	3	4	5	6	7	8
f(x):	27	64	125	216	343	512

10. (a) Find the value of the given variables by using Gauss elimination method: [7]

$$x + 3y + 6z = 10$$
$$x + 4y + 5z = 14$$
$$x + 6y + 7z = 18$$

..

(b) Solve the system of equations $x_1 + x_2 + x_3 = 1$, $3x_1 + x_2 - 3x_3 = 5$ and $x_1 - 2x_2 - 5x_3 = 10$ by LU factorization method. [8]

11. (a) [8]

Find the population of the city in 1925.The population of a city is given as:

Year(x)	Population(Thousand)
1891	46
1901	66
1911	81
1921	93
1931	101

(b) Find the missing value of the following table: [7]

x:	2	4	6	8	10
y:	5.6	8.6	13.9	-	35.6

*** END OF PAPER ***