Q.P. Code : 544102

(3 Hours) [Total Marks: 80

N.B.:
- Question No. 1 is compulsory.
- Answer any **three** from the remaining five questions.
- Assume suitable data if necessary and justify the same.
- Figures to the right indicate the marks.

1   Each question carry five marks   20

   a   What are the various criteria to terminate iterative methods in numerical computation?

   b   Explain the pitfalls of LU decomposition.

   c   Use Lagrange's inverse interpolation method to estimate 'x' at y=10 for the given three
       data points (1,2) and (3,15), (5,20).

   d   How one-dimensional unconstrained optimization problems can be solved by Qudratic
       interpolation method?

2   a   Use Runge-Kutta Method of Order 4 to solve $\frac{dy}{dx} = \frac{5x^2-y}{e^{x+y}}$ to calculate y at x=0.2,   10
       using a step size of h=0.1. Initial condition is given as y(0)=1.

   b   How Linear programming problem can be written in standard form? Solve the   10
       following LPP by graphical method and mark feasible region, basic feasible regions
       and optimal feasible region.

$$\text{Maximize } Z = 400X_1 + 200X_2$$

Subject to constraints
$$18X_1 + 3X_2 \le 800$$
$$9X_1 + 4X_2 \le 600$$
$$X_2 \le 150$$
$$X_1, X_2 \ge 0$$

3   a   Calculate the positive square root of 11 using both secant and false position method   10
       within e_s=0.5%. Employ initial guesses as 3 and 4. Compare the result and the selection
       of guesses in each iteration of secant and false position method.

   b   What is significant figures? What are the rules on determining how many significant   05
       figures are in a number? Identify the number of significant figures in 0.00800.

   c   Explain how second order differential equation can be solved by Picard's method?   05

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4 a Obtain the roots of following systems of equations using N-R method $f(x,y)=x^2+xy-10$ 10
and $g(x,y)=y+3xy^2-57$ with the initial guesses as $x_0=1.5$ and $y_0=3.5$. Do only two
iterations.

   b What is the advantage of solving set of linear algebraic equations using LU   10
decomposition? Solve the following systems of equations using LU decomposition.

$3x_1 + x_2 + 6x_3 = 9$

$-6x_1 - 16x_3 = -4$

$8x_2 - 17x_3 = 10$

5 a Explain suitable techniques to solve the following optimization problem.   10

     1. Multivariable optimization problem with in equality constraint.

     2. Multivariable optimization problem without constraint.

   b Explain various types of errors in numerical computation. How these errors can be   05
reduced?

   c Given $\frac{dy}{dx} = x^2(1+y)$ and $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.979$,   05
evaluate $y(1.4)$ till the error is less than 0.05% using Milman's method

6 a What are the various interpolation methods for curve fitting? Compare Linear   10
interpolation with quadratic interpolation method? Using Newton's Divided difference
method of order '3' find 'f(9)' from the following data with maximum accuracy.

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

   b Solve the following LPP by simplex method.   10

Maximize $Z = 3x + 2y$

Subject to constraints $2x + y \leq 18$

                    $2x + 3y \leq 42$

                    $3x + y \leq 24$

                    $x, y \geq 0$