

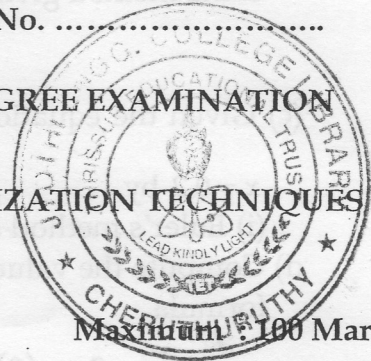
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Name:

Reg.No.

FIFTH SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION
DECEMBER 2010

CS 04 504 - NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES
(2004 ADMISSION)



Time: Three hours

Maximum: 100 Marks

Answer ALL questions.

1. a) What are the steps involved in solving a polynomial equation using bisection method?
- b) Find the value of y at $x = 0.2$ and at $n = 0.4$ for $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$ by Euler's method.
- c) Explain the methods finding initial solution for solving transportation problem.
- d) Explain the terms:
 - (i) Basic Solution
 - (ii) Feasible solution
 - (iii) Optimum solution
- e) Solve the system of equations:
$$\begin{aligned}x + y + z &= 13 \\ 3y + 2z &= 22 \\ x - z &= -2\end{aligned}$$
- f) Explain routing problem with an example.
- g) Compute the derivative of $f(x) = x^3$ at $x = 1$ for $h = 0.1$ and $h = 0.2$
- h) Compare slack variable, surplus variable and artificial variable.

(8 × 5 = 40)

2. a) Solve the following linear programming problem by simplex method:

$$\text{Maximize } Z = 5x_1 + x_2 + 4x_3$$

$$\text{Subject to } x_1 - 2x_2 + x_3 \leq 8$$

$$2x_1 + x_3 \leq 10$$

$$4x_1 - 5x_2 + x_3 \leq 20$$

$$x_1, x_2, x_3 \geq 0$$

OR

- b) Solve the following linear programming problem by big M method or two phase method:

$$\text{Minimize } Z = 8x_1 + 12x_2 + 2x_3$$

$$\text{Subject to } x_1 + x_2 + x_3 \leq 8$$

$$2x_1 + x_2 + 4x_3 \leq 16$$

$$x_1, x_2, x_3 \geq 0$$

3. a) Evaluate the integral $\int_0^1 e^{-x^2} dx$ using Simpson's $\frac{1}{3}$ rule taking step size $h = 0.1$

- b) Compute the value of y at $x=0.1$ and $x=0.2$ using Runge-Kutta 4th order method given that $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$

OR

- (c) Given the equation $\frac{dy}{dx} = \frac{x+y}{x^2+y^2}, y(0) = 1$, find the value of y at $x=0.1$ and

$x=0.2$ by

(i) Euler's method and (ii) Modified Euler's method.

- d) Compute the value of y at $X + .$ and $x=1.0$ using Milne's-Predictor-Corrector formula given that

$$\frac{dy}{dx} = x^2 + 2y, y(0) = 1, y(0.2) = 1.4948, y(.4) = 2.2519, y(.6) = 3.4201.$$

4. a) Find a root (correct to 4 decimal places) of the equation:

$$f(x) = x^4 + xe^{-x} - 10$$

Using Newton Raphson formula.

- b) Solve the following system of linear equation by Gauss-Seidel iterative procedure:

$$10x + 3y + 2z = 41$$

$$5x + 10y - z = 70$$

$$3x + 4y + 10z = 81$$

OR

- c) Find a lagrange interpolation polynomial to fit the following values of the table. Compute $y(0.8)$.

x	-1	0	2	5
y	12	10	24	180

- d) Compute the value of y at $x=16$ using Newton's forward difference formula using the following table:

x	10	20	30	40	50
y	0.3472	0.6840	1.000	1.2856	1.5320

5. a) Solve the following linear programming problem by Simplex method:-

Maximize $Z = 13x_1 + 15x_2 + 12x_3$

subject to $x_1 + 2x_2 + x_3 \leq 25$

$$x_1 - x_2 \leq 10$$

$$x_2 + 2x_3 \leq 20$$

$$x_1, x_2, x_3 \geq 0.$$

OR

- b) Solve the following linear programming problem by two phase method:-

Minimize $Z = 10x_1 + 15x_2 + 12x_3$

subject to $x_1 + 2x_2 + x_3 \geq 10$

$$x_1 - x_2 + 3x_3 \geq 20$$

$$x_1 + x_2 \geq 5$$

$$x_1, x_2, x_3 \geq 0$$

(15 × 4 = 60)
