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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:

   $$x + y + z = 13$$
   $$3y + 2z = 22$$
   $$x - z = -2$$

   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.

   $(8 \times 5 = 40)$

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

   Maximize $Z = 5x_1 + x_2 + 4x_3$

   Subject to
   $$x_1 - 2x_2 + x_3 \le 8$$
   $$2x_1 + x_3 \le 10$$
   $$4x_1 - 5x_2 + x_3 \le 20$$
   $$x_2, x_2, x_3 \le 0$$

   OR

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

   Minimize $Z = 8x_1 + 12x_2 + 2x_3$

   Subject to
   $$x_1 + x_2 + x_3 \le 8$$
   $$2x_1 + x_2 + 4x_3 \le 16$$
   $$x_1, x_2, x_3 \le 0$$

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 Runga-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 $x_1+2x_2+x_3\le 25$

$x_1-x_2\le 10$

$x_2+2x_3\le 20$

$x_1, x_2, x_3\le 0.$

OR

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

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

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

$x_1-x_2+3x_3\ge 20$

$x_1+x_2\ge 5$

$x_1, x_2, x_3\ge 0$

$(15\times 4=60)$

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