C 17902 (Pages : 3) Name..............................

Reg. No..............................

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2011

CE 04 704 (B)—COMPUTATIONAL METHODS AND OPERATIONS RESEARCH

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

1. (a) Given $\alpha = 9.00 \pm 0.05, b = 0.0356 \pm 0.0002,\ c = 15300 \pm 100, d = 62000 \pm 500$. Find the maximum value of absolute error in $a + b + c + d$.

   (b) Develop a computer algorithm to solve an algebraic equation using Newton-Raphson method.

   (c) The area, A of a circle of diameter, d is given for the following value :

d	80	85	90	95	100
A	5026	5674	6362	7088	7854

   Calculate the area of a circle of diameter 105.

   (d) Find the largest eigen value and the corresponding eigen vector of the matrix.

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & -4 & 2 \\ 0 & 0 & 7 \end{bmatrix}$$

   (e) Derive the expression for finding the derivative using Newton's forward interpolation formula.

   (f) Derive an expression for solving ordinary differential equations using Euler's method.

   (g) State and explain a non-linear programming problem.

   (h) Differentiate between assignment and transportation problems.

(8 × 5 = 40 marks)

Part B

2. (a) Find the root of the equation $2x^3 + x^3 - 20x + 12 = 0$, using the bisection method correct to three decimal places.

(7 marks)

Turn over

(b) Explain the importance of numerical methods in Civil Engineering. Give at least three examples.

(3 + 5 = 8 marks)

Or

(c) The total flexibility matrix of a structure is given by

$$[F_s] = \left(\frac{1}{36EI}\right)\begin{bmatrix} 72 & 72 & 288 & 1008 \\ 72 & 132 & 288 & 1308 \\ 288 & 288 & 1536 & 4416 \\ 1008 & 1308 & 4416 & 16496 \end{bmatrix}.$$ Take EI as constant. Determine the inverse of the matrix $[F_s]$ using (i) Gauss elimination method and (ii) Gauss Jordan method.

3. (a) Find the cubic spline corresponding to the interval $[2,3]$ from the following table :

x	1	2	3	4	5
y	30	15	32	18	25

Hence compute (i) y (2.5) and (ii) y' (3).

Or

(b) Find all the eigenvalues and the corresponding eigenvectors of the matrix

$$\begin{bmatrix} 5 & -4 & 6 \\ -4 & 9 & 2 \\ 6 & 2 & 4 \end{bmatrix},$$ using Jacobi's method.

4. (a) Use Euler's method to solve $y' = \frac{t-y}{2}$ on $[0,3]$ with $y(0) = 1$. Compare the solutions for $h = 1, \frac{1}{2}, \frac{1}{4}$ and $\frac{1}{8}$.

Or

(b) Find $\int_0^1 \left[1 + e^{-x} \sin(4x)\right] dx$ using (i) trapezoidal rule ; (ii) Simpon's 1/3rd rule ; and (iii) Simpson's 3/8 rule.

(5 + 5 + 5)

5. (a) Using dual simplex method

Maximize $2x_1 + x_2$.

subject to $3x_1 + x_2 \geq 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 3$

$x_1, x_2 \geq 0$

Or

(b) A company has three plants A, B, C and three warehouses X, Y, Z. The number of units available at the plant is 60, 70, 80 respectively. The demands at X, Y, Z are 50, 80, 80 respectively. The unit costs of transportation are as follows :

Plants	*Warehouse*		
	X	Y	Z
A	8	7	3
B	3	8	9
C	11	3	5

Find the allocation so that the total transportation cost is minimum.

[4 × 15 = 60 marks]