C 5464 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2010

CE 04 704—COMPUTATIONAL METHODS AND OPERATIONS RESEARCH

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

1. (a) Distinguish between absolute error, relative error and percentage error.

   (b) Develop a computer algorithm to solve an algebraic equation using bisection method.

   (c) What are the sufficient conditions for convergence of iterative method ?

   (d) Find the eigen values of the following matrix $\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$.

   (e) Derive Newton Cotes formula for numerical integration.

   (f) Using Taylor's series method, find y at $x = 0.1$ and 0.2 upto 3 decimals from $\frac{dy}{dx} = x^2y - 1, y(0) = 1$.

   (g) What are the limiations of LPP ?

   (h) State the necessary and sufficient condition for the existence of a feasible solution to a transportation problem.

(8 × 5 = 40 marks)

Part B

2. (a) The structure stiffness matrix, K for a structure is given by

$$K = (EI)\begin{bmatrix} 0.375 & -0.375 & 0.375 \\ & 3 & 1 \\ & & 3 \end{bmatrix}.$$

Take EI as constant. The load vector, $\{Q\} = \begin{Bmatrix} 58 \\ -16 \\ 16 \end{Bmatrix}$. Determine the nodal displacement vector, $\{q\} = \begin{Bmatrix} q_1 \\ q_2 \\ q_3 \end{Bmatrix}$ using (i) Gauss elimination method and (ii) Gauss Jordan method.

Or

[redacted]

Turn over

(b) Find a real root of the polynomial equation $f(x) = x^5 - 0.346284x^4 + x^3 + 3.768x + 10 = 0$ correct to six decimal places by using Newton-Raphson's formula.

3. (a) Fit a cubic spline to the following data and evaluate y (1.5) and y' (3).

x :	1	2	3	4
y :	1	2	5	11

Or

(b) Find the eigen value of the largest modulus and the associated eigen vector of the matrix

$$\begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$$ by Power method.

4. (a) Find an approximate value of $y = \int_0^{\pi} \cos x dx$ using (i) trapezoidal rule ; (ii) Simpson's 1/3 rule by dividing the range of integration into six equal parts. Calculate the percentage error from its true value in both the cases.

Or

(b) Given $\frac{dy}{dt} = \frac{y-t}{y+t}$, with initial condition $y = 1$ at $t = 0$. Find y approximately at $t = 0.1$, in five steps, using Euler's method.

5. (a) Solve the following LP problem using dual simplex method :

minimize $Z = x_1 + 2x_2 + 3x_3$

subject to $2x_1 - x_2 + x_3 > 4$

$x_1 + x_2 + 2x_3 < 8$

$x_2 - x_3 > 2$ and x_1 x_2 and $x_3 > 0$.

Or

(b) Solve the following transportation problem and interpret the result :

		Market 1	2	3	4	Supply
	A	5	2	4	3	22
Warehouse	B	4	8	1	6	15
	C	4	6	7	5	8
Requirement		7	12	17	9	

(4 × 15 = 60 marks)