CE

2013 Scheme

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Reg. No. : ....

Name : ....

First Semester M.Tech. Degree Examination, March 2013
(2008 Scheme) x out
CIVIL
Stream : (Structural Engg. and Structural Engg. and Construction Management)
CSM 1001 : Advanced Computational Mathematics

Time : 3 Hours

Max. Marks : 100

*Instructions : Answer **any five** questions.*
*All questions carry **equal** marks.*

I. a) Use Gauss elimination to solve

$$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$$
$$0.1x_1 + 7x_2 - 0.3x_3 = -19.3$$
$$0.3x_1 - 0.2x_2 + 10x_3 = 71.4$$

b) Fit quadratic splines to the following data :

x	:	3.0	4.5	7.0	9.0
f(x)	:	2.5	1.0	2.5	0.5

Use the result to estimate the value at x = 5.

II. a) Explain Jacobi's Iteration method for computing the eigen values of a symmetric matrix.

b) Given the following ,

x_1	x_2	y
0	0	5
2	1	10
2.5	2	9
1	3	0
4	6	3
7	2	27

use multiple linear regression to fit the above data.

P.T.O.

III. a) Evaluate $\int_{0.1}^{1.3} 5x\, e^{-2x}\, dx$ by 3 point Gauss-quadrature formula.

b) Find a positive real root of the equation 2 sin x = x.

IV. a) Apply Runge-Kutta method to solve numerically

$\frac{dy}{dx} = x + y,\ y(0) = 1$ for $0 \le x \le 1$ with $h = 0.2$.

b) Given $\frac{2dy}{dx} = (1+x^2)y^2,\ y(0) = 1,\ y(0.1) = 1.06,\ y(0.2) = 1.12,\ y(0.3) = 1.21,$ evaluate $y(0.4)$ by Milne's predictor-corrector method.

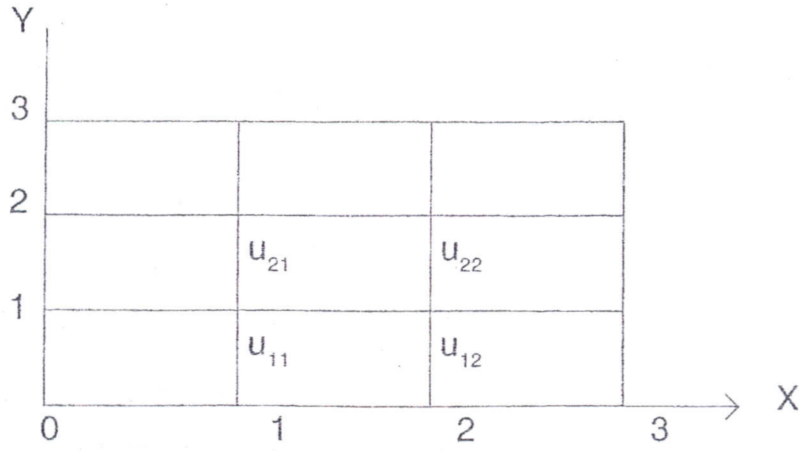
V. a) Explain briefly :

i) Collocation method ii) Subdomain method iii) Method of least squares

b) Use Galerkin's method to solve the boundary value problem

$y'' + y + x = 0,\ 0 \le x \le 1;\ y(0) = 0;\ y(1) = 0.$

VI. a) Solve numerically the Laplaces equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the grid shown below. Compute 4 steps with starting values 100, 100, 100, 100 for $u_{11}\ u_{12}\ u_{21}\ u_{22}$ if the boundary values on the edges are $u(1, 0) = 60,\ u(2, 0) = 300,$ $u = 100$ on the other three edges.



b) Solve numerically using explicit method,

$u_t = u_{xx},\ 0 \le x \le 1,\ u(0, t) = 0,\ u(1, t) = 0$

$u(x, 0) = 2x,\ 0 \le x \le 0.5$

$= 2(1 - x);\ 0.5 \le x \le 1$

use $h = 1,\ k = 0.001$ at $t = 0.001, 0.002.$