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Reg. No. : .....

Name : .....

First Semester M.Tech. Degree Examination, February 2015
(2013 Scheme)
Civil Engineering
Stream : Structural Engineering
CSM 1001 : ADVANCED NUMERICAL METHODS

Time : 3 Hours Max. Marks : 60

Answer **any two** questions from **each** Module.

MODULE – I

1. Solve by Choleski's method.

$2x_1 - 3x_2 - x_3 + 2x_4 = 15$

$-x_1 + x_2 + 2x_3 - 2x_4 = -13$

$x_1 - x_2 + x_3 + x_4 = 4$

$3x_1 + 2x_2 - x_3 - x_4 = 3$ 10

2. a) Explain a method for solution of non-linear simultaneous equations. 3

b) Find all the eigen values and eigen vectors of matrix A.

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$ 7

3. a) What are the necessary conditions for convergence of iterative methods ? Give example. 4

b) Solve using Gauss Seidel iteration.

$4x_1 + 2x_2 = 2$

$2x_1 + 10x_2 + 4x_3 = 6$

$4x_2 + 5x_3 = 6.$ 6

P.T.O.

MODULE – II

4. a) Explain Hermitian interpolation. **4**

   b) Obtain the cubic spline approximation of given data. Hence evaluate y(1.5) and y′(3). **6**

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

5. a) Explain multiple linear regression. **4**

   b) Fit a curve of the form $y = ae^{bx}$ to the following data : **6**

x :	1	2	3	4	5	6	7	8
y :	15.3	20.5	27.4	36.6	49.1	65.6	87.8	117.6

6. a) Explain any one predictor–corrector method for solving ordinary differential equation. **4**

   b) Using modified Euler method, solve the equation in the range $0 \le x \le 1.0$ $\frac{dy}{dx} = x + y^2$; y(0) = 2 solve with step size 0.05. **6**

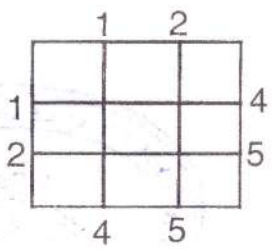
MODULE – III

7. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, subject to the conditions u (x, 0) = Sin πx , $0 \le x \le 1$

   u (0, t) = u (1, t) = 0

   Carry out the computations for two levels with h = $\frac{1}{3}$ and k = $\frac{1}{36}$ **10**

8. Solve the equation $U_{xx} + U_{yy} = 0$ for the square mesh with the boundary values as shown below : **10**



9. Solve $y'' + x^2 = 0$ for $0 \le x \le 1$ with boundary conditions y(0) = y(1) = 0 use method of least squares. **10**