

**R09****Code No: C2001**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M.Tech I - Semester Examinations, March/April 2011**  
**COMPUTER ORIENTED NUMERICAL METHODS**  
**(STRUCTURAL ENGINEERING)**

**Time: 3hours****Max. Marks: 60**

**Answer any five questions**  
**All questions carry equal marks**

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- 1.a) Express the matrix  $A = \begin{bmatrix} 1 & 7 & 8 \\ 6 & 2 & 9 \\ 5 & 4 & 3 \end{bmatrix}$ ; as the sum of a symmetric and a skew

symmetric matrix.

- b) Solve the system  $2x + y + z = 10$   
 $3x + 2y + 3z = 18$   
 $x + 4y + 9z = 16$

by the Gauss-Jordan method.

[12]

- 2.a) Find the solutions, to three decimals, of the system

$$83x + 11y - 4z = 95$$

$$7x + 52y + 13z = 104$$

$$3x + 8y + 29z = 71$$

Using Jacobi and Gauss-Seidal methods.

- b) Determine the largest Eigen value and the corresponding Eigen vector of the matrix; [12]

$$\begin{bmatrix} 10 & -2 & 1 \\ -2 & 10 & -2 \\ 1 & -2 & 10 \end{bmatrix}$$

- 3.a) Solve by Euler method, the equation

$$\frac{dy}{dx} = x + y, \quad y(0) = 0$$

Choose  $h = 0.2$  and compute  $y(0.4)$  and  $y(0.6)$ 

- b) If  $\frac{dy}{dx} = \frac{1}{x^2 + y}$  where  $y(4) = 4$ , compute the values of  $y(4.1)$  and  $y(4.2)$  by

Taylor's series method.

[12]

- 4.a) Derive the Gaussian integration formula when  $n = 2$ , and apply this formula to evaluate the integral

$$\int_{-1}^1 \frac{1}{1+x^2} dx$$

**Contd.....2**

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- b) Evaluate the following double integral

$$\int_{-2}^2 \int_0^2 (x^2 - xy + y^2) dx dy \text{ by using Simpson's } \frac{1}{3} \text{ rule.} \quad [12]$$

- 5.a) Using the cubic spline technique, solve the boundary value problems of:

- i)  $y'' - y = 0$ ,  $y(0) = 0$  and  $y(1) = 1$   
 ii)  $y'' + 2y' + y = 30x$ ,  $y(0) = 0$  and  $y(1) = 0$
- b) Solve the boundary value problem of:  
 $y'' - 64y + 10 = 0$ ,  $y(0) = y(1) = 0$  by the shooting method. [12]

- 6.a) Tabulate the function  $y = \sin x$  for  $x = 0$  to  $1.0$  in steps of  $h = 0.01$ . Find the error of linear interpolation in this table.

- b) Find the error of quadratic interpolation in the above problem. [12]

- 7.a) Given  $\frac{dy}{dx} - 1 = xy$  and  $y(0) = 1$ . Obtain the Taylor series for  $y(x)$  and compute  $y(0.1)$  correct to four decimal places.

- b) Solve the boundary value problem  
 $y'' - 64y + 10 = 0$ ,  $y(0) = y(1) = 0$  by the finite difference method. [12]

- 8.a) Evaluate  $\int_0^{\pi} t \sin t dt$  using the trapezoidal rule.

- b) Evaluate  $\int_0^{\pi/2} \sqrt{\sin \theta} d\theta$  using Simpson's rule with  $h = \pi/12$ . [12]

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