

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.Tech I - Semester Examinations, April/May -2012  
COMPUTER ORIENTED NUMERICAL METHODS  
(STRUCTURAL ENGINEERING)

Time: 3 hours

Max. Marks: 60

Answer any five questions  
All questions carry equal marks

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1. Solve the following system by Gauss- Jacobi and Gauss – Seidel method:  
 $10x - 5y - 2z = 3;$   
 $4x - 10y + 3z = -3;$   
 $x + 6y + 10z = -3.$

2.a) Apply Gauss-Jordan method to find the solution of the following system:  
 $10x + y + z = 12;$   
 $2x + 10y + z = 13;$   
 $x + y + 5z = 7.$

b) Reduce the matrix to the tridiagonal form by Householder's method

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

3. Fit the quadratic splines with  $M(0)=f''(0)=0$ . Hence find an estimate of  $f(2.5)$  data as given below.  
x        0        1        2        3  
f(x)    1        2        33      244

4. Solve the following by means of Euler method  
 $y' = x + y, y(0) = 1.0$ . Find  $y(0.1), y(0.5)$ .

5. The following table of values are given for a function  $f(x,y)$

y/x	0.1	0.2	0.3
0.1	2.0200	2.0351	2.0403
0.2	2.0351	2.0801	2.1153
0.3	2.0403	2.1153	2.1803

- a) Estimate the values of  $\delta f / \delta x$  at (0.2, 0.1) and  $\delta f / \delta y$  at (0.2, 0.2) by first order and second order formulas.
- b) Estimate the values of  $(\delta^2 f / \delta x \delta y)$  at (0.2, 0.2) using second order formula.

6.a) Explain Richardson's extrapolation method.  
b) What is beam deflection? Explain.

7.a) Describe how the definition of double integral can be used to find approximations of double integrals over coordinate rectangles.  
b) Explain how Simpson's Rule solves double integrals.

8. Find out the undetermined coefficients a, b and c such that the formula is exact for polynomials as higher order as possible and determine the order of truncation error

$$\int_0^h f(x) dx = h \left\{ a f(0) + b f\left(\frac{h}{3}\right) + c f(h) \right\}$$

\*\*\*\*\*

# Computer Oriented Numerical Methods

**G. Alefeld, R. D. Grigorieff**



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## **Table of Contents Computer Oriented Numerical Methods**

1. Understanding the eBook Computer Oriented Numerical Methods
  - The Rise of Digital Reading Computer Oriented Numerical Methods
  - Advantages of eBooks Over Traditional Books
2. Identifying Computer Oriented Numerical Methods
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Computer Oriented Numerical Methods
  - User-Friendly Interface
4. Exploring eBook Recommendations from Computer Oriented Numerical Methods
  - Personalized Recommendations
  - Computer Oriented Numerical Methods User Reviews and Ratings
  - Computer Oriented Numerical Methods and Bestseller Lists
5. Accessing Computer Oriented Numerical Methods Free and Paid eBooks
  - Computer Oriented Numerical Methods Public Domain eBooks
  - Computer Oriented Numerical Methods eBook Subscription Services
  - Computer Oriented Numerical Methods Budget-Friendly Options

6. Navigating Computer Oriented Numerical Methods eBook Formats
  - ePub, PDF, MOBI, and More
  - Computer Oriented Numerical Methods Compatibility with Devices
  - Computer Oriented Numerical Methods Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Computer Oriented Numerical Methods
  - Highlighting and Note-Taking Computer Oriented Numerical Methods
  - Interactive Elements Computer Oriented Numerical Methods
8. Staying Engaged with Computer Oriented Numerical Methods
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Computer Oriented Numerical Methods
9. Balancing eBooks and Physical Books Computer Oriented Numerical Methods
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Computer Oriented Numerical Methods
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Computer Oriented Numerical Methods
  - Setting Reading Goals Computer Oriented Numerical Methods
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Computer Oriented Numerical Methods
  - Fact-Checking eBook Content of Computer Oriented Numerical Methods
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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1 0 introduction 2 2 0

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