Code No: R09220306 **R09** **Set No. 2**

II B.Tech II Semester Examinations,April/May 2012
NUMERICAL METHODS
(Common to ME,MECT,MEP,MIE.MIM)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Show that Newton-Raphson converges quadratically.
   (b) Apply Newton Raphson method to find a fifth root of 3 correct up to three decimal places. [7+8]

2. Fit the following four points by the cubic spline:

x	1	2	3	4
y	1	5	11	8

   under the conditions f''(1)=0=f''(4). Hence compute y(1.5) and y'(2.5). [15]

3. For the following data, fit the exponential curve of the form $y = ae^{bx}$ by the method of least squares.

x	0	1	2	3
y	1.05	2.10	3.85	8.30

   [15]

4. Show that both the
   (a) Jacobi method
   (b) Gauss Seidel methods diverge for solving the system of equations

$$\begin{bmatrix} 2 & 3 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -1 \\ 1 \\ 6 \end{bmatrix}$$

   [15]

5. (a) Given that $y' = 2x^2 + 2y$ with y (-0.6) = 0.1918, y (-0.4) = 0.414, y (-0.2) = 0.6655, y(0) =1. Estimate y(0.2) using Adams-Bashforth method.
   (b) Differentiate between Runge Kutta forth order method and Runge Kutta second order method. [8+7]

7. Write an explicit formula to solve numerically the heat equation (parabolic equation) $u_{xx} - au_t = 0$ and explain method to solve the equation. [15]

8. Use Jocobi method for finding out the eigen values and the corresponding eigen vector for the matrix given below. $\begin{bmatrix} 3 & 2 & 0 \\ 2 & 3 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ [15]

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6.(a) The following data for the function $f(x) = x^4$ is given for the range of x value from 0.4 to 0.8.

x	0.4	0.6	0.8
f(x)	0.0256	0.1296	0.4096

Then find $f'(0:8)$ and $f''(0:8)$ using quadratic interpolation. Compare the exact solution and obtain the bound on truncation errors.

(b) Derive the solution for integral equation based on Trapezoidal method. [8+7]

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Code No: R09220306 **R09** **Set No. 4**

II B.Tech II Semester Examinations,April/May 2012
NUMERICAL METHODS
(Common to ME,MECT,MEP,MIE.MIM)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Calculate the first and second order differences for f(x) = ab^{cx} [15]

2. Locate and correct the error in the following table of values.

x	2.5	3.0	3.5	4.0	4.5	5	5.5
y	4.32	4.83	5.27	5.47	6.26	6.79	7.23

[15]

3. Derive the procedure for fitting a straight line by the method of least squares. [15]

4. (a) In any general second order partial differential equation with two independent variables, describe the condition for elliptic, parabolic and hyperbolic nature.
   (b) State and explain Liebmann's iteration method for the solving the partial differential equations. [7+8]

5. Obtain a root for each of the following equation correct to three decimal places using the Bisection method.
   f(x) = x^3 - x - 4 = 0 [15]

6. (a) Give the equations for Runge Kutta method based on Taylor's series and solve the following differential equation dy/dx = xy + y^3 at y (0.1) and y(0.2) with the specified initial value of y(0) = 0.
   (b) In solving dy/dx = f(x,y), $y(x_0) = y_0$, write down Taylor's series for $y(x_1)$. [8+7]

7. Solve the following system using
   (a) Gauss Elimination method
   (b) Gauss Jordan Method

   10x + 2y + z = 9
   2x + 20y - 2z = - 44
   - 2x + 3y + 10z = 22 [15]

8. Determine a, b and c such that the formula $\int$ f(x) dx = h{af(0) + bf(h/3) + c f(h)} with the limits x = 0 to x = h is exact for polynomials of as high order as possible and determine the order of the truncation error. [15]

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Code No: R09220306 **R09** **Set No. 1**

II B.Tech II Semester Examinations,April/May 2012
NUMERICAL METHODS
(Common to ME,MECT,MEP,MIE.MIM)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Using the Euler's method solve dy/dx = 1 + xy with y(0) = 2, calculate the values of y(0.1), y(0.2) and y(0.3) and compare the solution with the modified Euler's method. [15]

2. (a) What are the errors associated in the finite difference method? Explain them with the examples.
   (b) Differentiate between initial value problem and boundary value problem for solving the ordinary differential equations. [7+8]

3. Given the table of values

x	150	152	154	156
$y - \sqrt{x}$	12.247	12.329	12.410	12.490

   Evaluate $\sqrt{155}$ using Legrange's interpolation formula. [15]

4. (a) What is the convergence of Bisection method?
   (b) Find a real root of f(x) = x + tan x - 1 = 0 in the interval (0, 0.5) by using Bisection method. [7+8]

5. Write down the implicit formula to solve one dimensional heat flow equation and suggest the suitable method to solve the equations. [15]

6. (a) For the given values of $u_0 = 4$; $u_1 = 14$; $u_2 = 51$ and du/dx = 2 at x = 0 and 65 at x = 2. Then calculate $\Delta^3 u_0$ and $\Delta^4 u_0$.
   (b) The velocity v of a particle at distance s from a point on its path is given by the table below.

s in meters :	0	10	20	30	40	50	60
V in m/s :	33	39	60	68	58	49	40

   Calculate time taken to travel 60 m by using Simpson's $1/3^{rd}$ rule. [8+7]

7. Fit the curve of the form $y = ae^{bx}$ to the following data.

x	77	100	185	239	285
y	2.4	3.4	7.0	11.1	19.6

   [15]

8. Given the $A = I + L + U$ matrix where $A = \begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 2 & 2 & 1 \end{bmatrix}$, L and U are strictly lower and upper triangular matrices respectively, decide whether
   (a) Jacobi

(b) Gauss Seidel methods converge to the solution of $Ax = b$. [15]

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Code No: R09220306 **R09** **Set No. 3**

II B.Tech II Semester Examinations,April/May 2012
NUMERICAL METHODS
(Common to ME,MECT,MEP,MIE.MIM)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Find a square root of 26 correct up to three decimal places by using Bisection method. [15]

2. Using Taylor's method solve dy/dx = 1 + xy with $y_0 = 2$, calculate

   (a) y(0.1)

   (b) y(0.2)

   (c) y(0.3)

   And also compare with the exact solution. [15]

3. (a) Write the finite difference scheme of the differential equation $y'' + y = 0$.

   (b) Give an example of a parabolic equation and explain the method to solve it for the specified boundary conditions. [7+8]

4. The velocity v of a particle at distance s from a point on its path is given by the table below.

S in meters	0	10	20	30	40	50	60
V in m/s	46	57	63	66	62	58	37

   Estimate the time table to travel 60 meters by using Simpson's $3/8^{th}$ rule. [15]

5. (a) Solve by finite difference method, the boundary value problem $y''(x) - y(x) = 2$ where y(0) = 0 and y(1) = 1, taking h = 1/4 .

   (b) Solve $xy = y''$ given y(0) = -1, y(1) = 2 by finite difference method with h = 0.5. [7+8]

6. Obtain an approximate linear least squares fit for the data given below

x	5	10	15	20	25
y	15	19	23	26	30

   Estimate y corresponding to x = 13. [15]

7. (a) Find the condition number of the system $\begin{bmatrix} 2.1 & 1.8 \\ 6.2 & 5.3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 2.1 \\ 6.2 \end{bmatrix}$. State the condition of the system.

   (b) Determine the Euclidean and maximum absolute row sum norms of the matrix $A = \begin{bmatrix} 1 & 7 & -4 \\ 4 & -4 & 9 \\ 12 & -1 & 3 \end{bmatrix}$ [7+8]

8. Given the set of values

x	10	15	20	25	30	35
y	19.97	21.57	22.47	23.52	24.65	25.89

Form the difference table and write down the values of $\Delta^2 y_{10}, \Delta y_{10}, \Delta^3 y_{10}, and, \Delta^5 y_{10}$. [15]

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