Reg. No. :

Question Paper Code : 27335

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fourth Semester

Civil Engineering

MA 6459 — NUMERICAL METHODS

(Common to Aeronautical Engineering, Electrical and Electronics Engineering, Instrumentation and Control Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Geoinformatics Engineering, Petrochemical Engineering, Production Engineering, Chemical and Electrochemical Engineering, Textile Chemistry and Textile Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is the criterion for the convergence of Newton-Raphson method?

2. Give two direct methods to solve a system of linear equations.

3. For cubic splines, what are the 4n conditions required to evaluate the unknowns.

4. Construct the divided difference table for the data $(0, 1)$, $(1, 4)$, $(3, 40)$ and $(4, 85)$.

5. Apply two point Gaussian quadrature formula to evaluate $\int_0^2 e^{-x^2} dx$.

6. Under what condition Simpson's $\frac{3}{8}$ rule can be applied and state the formula.

7. Using Euler's method, find $y(0.1)$ given that $\frac{dy}{dx} = x + y$, $y(0) = 1$.

8. State Adam's Predictor–Corrector formulae.

9. What is the central difference approximation for y''?

10. Write down the difference scheme for solving the equation $y_{tt} = a^2 y_{xx}$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the largest eigenvalue and the corresponding eigenvector of a matrix $\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$. (8)

(ii) Using Gauss Jordan method find the inverse of a matrix $\begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$. (8)

Or

(b) (i) Apply Gauss-Seidal method to solve the equations (8)

$$28x + 4y - z = 32$$
$$x + 3y + 10z = 24$$
$$2x + 17y + 4z = 35.$$

(ii) Find the root of $4x - e^x = 0$ that lies between 2 and 3 by Newton-Raphson method. (8)

12. (a) (i) Using Lagrange's interpolation formula calculate the profit in the year 2000 from the following data : (8)

Year:	1997	1999	2001	2002
Profit in lakhs of Rs. :	43	65	159	248

(ii) Using Newton's forward interpolation formula, find the cubic polynomial which takes the following values : (8)

x :	0	1	2	3
y :	1	2	1	10

Or

(b) The following values of x and y are given: (16)

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

Find the cubic splines and evaluate $y(1.5)$.

13. (a) (i) Using Trapezoidal rule evaluate $\int_0^1\int_0^1 \frac{dxdy}{x+y+1}$ with $h=0.5$ along x-direction and $k=0.25$ along y-direction. (8)

(ii) Find $f'(10)$ from the following data: (8)

x:	3	5	11	27	34
y:	−13	23	899	17315	35606

Or

(b) Use Romberg's method to evaluate $\int_0^1 \frac{dx}{1+x^2}$ correct to 4 decimal places. Also compute the same integral using three point Gaussian quadrature formula. Comment on the obtained values by comparing with the exact values of the integral which is equal to $\frac{\pi}{4}$. (16)

14. (a) Determine the value of $y(0.4)$ using Milne's method given $y' = xy + y^2$, $y(0)=1$. Use Taylor's series method to get the values of $y(0.1)$, $y(0.2)$ and $y(0.3)$. (16)

Or

(b) Find $y(0.1)$, $y(0.2)$ and $y(0.3)$ from $y' = x + y^2$, $y(0)=1$ by using Runge-Kutta method of Fourth order and then find $y(0.4)$ by Adam's method. (16)

15. (a) (i) Solve $y'' = x + y$ with the boundary conditions $y(0)=y(1)=0$. (6)

(ii) Solve the equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ subject to the conditions $u(x, 0) = \sin \pi x$, $0 < x < 1$ $u(0, t) = u(1, t) = 0$ using Bender Schemidt method. (10)

Or

Reg. No. :

Question Paper Code : 72074

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fourth/Fifth/Sixth/Seventh Semester

Civil Engineering

MA 6459 — NUMERICAL METHODS

(Common to Aeronautical Engineering, Agriculture Engineering, Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Geoinformatics Engineering, Instrumentation and Control Engineering, Manufacturing Engineering, Mechanical and Automation Engineering, Petrochemical Engineering, Production Engineering, Chemical Engineering, Chemical and Electrochemical Engineering, Handloom and Textile Technology, Petrochemical Technology, Plastic Technology, Polymer Technology, Textile Chemistry, Textile Technology

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the Newton-Raphson formula and the criteria for convergence.

2. Find the dominant eigenvalue of $A=\begin{pmatrix} 2 & 3 \\ 5 & 4 \end{pmatrix}$ by power method upto 1 decimal place accuracy. Start with $X^{(0)}=\begin{pmatrix} 1 \\ 1 \end{pmatrix}$.

3. Find the Lagrange's interpolating polynomial passing through the points $(0, 0)$, $(1, 1)$, $(2, 20)$.

4. Define a cubic spline.

5. Find $\frac{dy}{dx}$ at $x = 50$ from the following table :

x :	50	51	52
y :	3.6840	3.7084	3.7325

6. Evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$ by using two point Gaussian formula.

7. Using Euler's method, compute $y(0.1)$, given $\frac{dy}{dx} = 1 - y$, $y(0) = 0$.

8. State Adam-Bashforth predictor and corrector formulae to solve first order ordinary differential equation.

9. Write down the finite difference scheme for solving $y'' + x + y = 0$; $y(0) = y(1) = 0$.

10. Derive explicit finite difference scheme for $u_t = u_{xx}$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find a real root of the equation $\cos x = 3x - 1$ correct to three decimal places using fixed point iteration method. (8)

(ii) Find the solution of the system of following equations by Gauss-Seidal method (Upto 4 iterations). (8)

$$x - 2y + 5z = 12$$
$$5x + 2y - z = 6$$
$$2x + 6y - 3z = 5.$$

Or

(b) (i) Using Gauss-Jordan method, find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & -1 \\ 4 & 1 & 0 \\ 2 & -1 & 3 \end{pmatrix}$. (8)

(ii) Solve the following system of equations by Gauss Elimination method (8)

$$x + 2y - 5z = -9$$
$$3x - y + 2z = 5$$
$$2x + 3y - z = 3.$$

12. (a) (i) Find $f(1)$ by using divided difference interpolation from the following data : (8)

x :	-4	-1	0	2	5
$f(x)$:	1245	33	5	9	1335

(ii) Find a polynomial of degree two for the data by Newton's forward difference formula. (8)

x :	0	1	2	3	4	5	6	7
y :	1	2	4	7	11	16	22	29

Or

(b) Find the cubic spline in the interval $1 \leq x \leq 2$ and hence evaluate $y(1.5)$ and $y'(1.5)$ by using the following data : (16)

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

13. (a) (i) Using backward difference, find $y'(2.2)$ and $y''(2.2)$ from the following table : (6)

x :	1.4	1.6	1.8	2.0	2.2
y :	4.0552	4.9530	6.0496	7.3891	9.0250

(ii) The following table gives the values of $y = \frac{1}{1+x^2}$. Take $h = 0.5$, 0.25, 0.125 and use Romberg's method to compute $\int_0^1 \frac{1}{1+x^2} dx$. Hence deduce an approximate value of π. (10)

x :	0	0.125	0.25	0.375	0.5	0.675	0.75	0.875	1
y :	1	0.9846	0.9412	0.8767	0.8	0.7191	0.64	0.5664	0.5

Or

(b) (i) Using Simpson's $\frac{1}{3}$ rule, evaluate $\int_0^1 \int_0^1 \frac{dx\,dy}{1+xy}$ with $h = k = 0.25$. (8)

(ii) Evaluate $\int_0^5 \log_{10}(1+x)\, dx$ by three points Gauss quadrature formula. (8)

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14. (a) (i) Find the value of $y(0.1)$, $y(0.2)$ with $h=0.1$, given $\frac{dy}{dx}=x^2y-1$, $y(0)=1$ by Taylor's series method upto four terms. (8)

(ii) Derive the Milne's predictor-corrector formula for solving first order differential equation $y'=f(x,y)$, $y_0=y(x_0)$. (8)

Or

(b) (i) Using Runge-Kutta method of order four, solve $y''=xy'^2-y^2$, $y(0)=1$, $y'(0)=0$ for $x=0.2$ correct to 4 decimal places with $h=0.2$. (8)

(ii) Given $\frac{dy}{dx}=y-x^2+1$, $y(0)=0.5$. Find $y(0.2)$ by modified Euler's method. (8)

15. (a) (i) Using Crank-Nicholson scheme, solve $u_{xx}=16u_t$, $0<x<1$, $t>0$ given $u(x,0)=0$, $u(0,t)=0$ and $u(1,t)=100t$. Take $\Delta x=\frac{1}{4}$ and $\Delta t=1$. Compute u for one time step at the interior mesh points. (8)

(ii) Solve the Poisson equation $u_{xx}+u_{yy}=-81xy$, $0<x<1$; $0<y<1$ $u(0,y)=0$, $u(1,y)=100$, $u(x,0)=0$, $u(x,1)=100$ and $h=\frac{1}{3}$.

Or

(b) (i) Solve numerically, $4\frac{\partial^2 u}{\partial x^2}=\frac{\partial^2 u}{\partial t^2}$ with the boundary conditions $u(0,t)=0$, $u(4,t)=0$ and the initial condition $u_t(x,0)=0$ and $u(x,0)=x(4-x)$ taking $h=1$ (for 4 times steps). (8)

(ii) Solve : $y''-y=x$, $0<x<1$, given $y(0)=y(1)=0$ using finite differences dividing the interval into 4 equal parts. (8)

Reg. No. :

Question Paper Code : 51576

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Sixth Semester

Computer Science and Engineering

MA 2264/MA 41/MA 51/MA 1251/080280026/10177 MA 401/10144 CSE 21/ 10144 ECE 15 — NUMERICAL METHODS

(Common to Sixth Semester – Electronics and Communication Engineering Industrial Engineering and Information Technology, Fifth Semester – Polymer Technology, Chemical Engineering and Polymer Technology, Fourth Semester – Aeronautical Engineering, Civil Engineering, Electrical and Electronics Engineering and Mechatronics Engineering)

(Regulation 2008/2010)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Evaluate $\sqrt{15}$ using Newton-Raphon's formula.

2. Using Gauss elimination method solve : $5x + 4y = 15, 3x + 7y = 12$.

3. Find the second divided difference with arguments a, b, c if $f(x) = \dfrac{1}{x}$.

4. Define cubic spline.

5. Write down the expression for $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ at $x = x_n$ by Newton's backward difference formula.

6. Taking $h = 0.5$, evaluate $\displaystyle\int_1^2 \frac{dx}{1+x^2}$ using Trapezoidal rule.

7. State the advantages and disadvantages of the Taylor's series method.

8. State the Milne's predictor and corrector formulae.

9. Obtain the finite difference scheme for the differential equation $2y''(x) + y(x) = 5$.

10. State whether the Crank Nicholson's scheme is an explicit or implicit scheme. Justify.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Find the numerically largest eigens value of $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ and its corresponding eigen vector by power method, taking the initial eigen vector as $(1\ 0\ 0)^T$ (upto three decimal places). (8)

(ii) Using Gauss–Jordan method, find the inverse of $\begin{bmatrix} 2 & 2 & 6 \\ 2 & 6 & -6 \\ 4 & -8 & 8 \end{bmatrix}$. (8)

Or

(b) (i) Solve the system of equations by Gauss–Jordan method : $5x_1 - x_2 = 9; -x_1 + 5x_2 - x_3 = 4; -x_2 + 5x_3 = -6$. (8)

(ii) Using Gauss–Seidel method, solve the following system of linear equations $4x + 2y + z = 14;\ x + 5y - z = 10;\ x + y + 8z = 20$. (8)

12. (a) (i) Find $f(3)$ by Newton's divided difference formula for the following data : (8)

x :	–4	–1	0	2	5
y :	1245	33	5	9	1335

(ii) Using Lagrange's interpolation formula, find $y(2)$ from the following data :

$y(0) = 0;\ y(1) = 1;\ y(3) = 81;\ y(4) = 256;\ y(5) = 625$. (8)

Or

(b) Fit the cubic splines for the following data : (16)

x :	1	2	3	4	5
y :	1	0	1	0	1

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13. (a) (i) For the given data, find the first two derivatives at $x = 1.1$ (8)

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

(ii) Evaluate $\int_0^{\frac{1}{2}} \frac{x}{\sin x} dx$ correct to three decimal places using Romberg's method. (8)

Or

(b) (i) Taking $h = 0.05$, evaluate $\int_1^{1.3} \sqrt{x}\, dx$ using Trapezoidal rule and Simpson's three-eighth rule. (8)

(ii) Taking $h = k = \frac{1}{4}$, evaluate $\int_0^{\frac{1}{2}} \int_0^{\frac{1}{2}} \frac{\sin(xy)}{1+xy} dx\, dy$ using Simpson's rule. (8)

14. (a) (i) Using Adam's Bashforth method, find $y(4.4)$ given that $5xy' + y^2 = 2$, $y(4) = 1$, $y(4.1) = 1.0049$, $y(4.2) = 1.0097$ and $y(4.3) = 1.0143$. (8)

(ii) Using Taylor's series method, find y at $x = 1.1$ by solving the equation $\frac{dy}{dx} = x^2 + y^2; y(1) = 2$. Carryout the computations upto fourth order derivative. (8)

Or

(b) Using Runge Kutta method of fourth order, find the value of y at $x = 0.2, 0.4, 0.6$ given $\frac{dy}{dx} = x^3 + y, y(0) = 2$. Also find the value of y at $x = 0.8$ using Milne's predictor and corrector method. (16)

15. (a) (i) Using Bender–Schmidt's method solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ given $u(0,t) = 0, u(1,t) = 0, u(x,0) = \sin \pi x, 0 < x < 1$ and $h = 0.2$. Find the value of u upto $t = 0.1$. (8)

(ii) Solve $y'' - y = x$, $x \in (0,1)$ given $y(0) = y(1) = 0$ using finite differences by dividing the interval into four equal parts. (8)

Or

Reg. No. :

Question Paper Code : 91583

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Sixth Semester

Computer Science and Engineering

MA 2264/MA 41/MA 51/MA 1251/080280026/10177 MA 401/10144 CSE 21/
10144 ECE 15 — NUMERICAL METHODS

(Common to Sixth Semester – Electronics and Communication Engineering Industrial Engineering and Information Technology, Fifth Semester – Polymer Technology, Chemical Engineering and Polymer Technology, Fourth Semester – Aeronautical Engineering, Civil Engineering, Electrical and Electronics Engineering and Mechatronics Engineering)

(Regulation 2008/2010)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Write down the condition for convergence of Newton–Rephson method for $f(x) = 0$.

2. Find the inverse of $A = \begin{pmatrix} 1 & 3 \\ 2 & 7 \end{pmatrix}$ by Gauss–Jordan method.

3. Find the second degree polynomial through the points $(0,2), (2,1), (1,0)$ using Lagrange's formula.

4. State Newton's backward formula for interpolation.

5. State the local error term in Simpson's $\frac{1}{3}$ rule.

6. State Romberg's integration formula to find the value of $I = \int_a^b f(x)dx$ for first two intervals.

7. State the Milne's predictor – corrector formulae.

8. Given $y' = x + y, y(0) = 1$ find $y(0.1)$ by Euler's method.

9. What is the central difference approximation for y''?

10. Write down the standard five-point formula to find the numerical solution of Laplace equation.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Apply Gauss-Seidal method to solve the system of equations $20x + y - 2z = 17$; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$. (8)

(ii) Find by Newton-Raphson method a positive root of the equation $3x - \cos x - 1 = 0$. (8)

Or

(b) (i) Find the numerically largest eigenvalue of $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ and the corresponding eigenvector. (8)

(ii) Using Gauss–Jordan method to solve $2x - y + 3z = 8$; $-x + 2y + z = 4$; $3x + y - 4z = 0$. (8)

12. (a) (i) Using Newton's forward interpolation formula, find the cubic polynomial which takes the following values : (8)

x	0	1	2	3
$f(x)$	1	2	1	10

(ii) Obtain the cubic spline approximation for the function $y = f(x)$ from the following data, given that $y_0'' = y_3'' = 0$. (8)

x	−1	0	1	2
y	−1	1	3	35

Or

(b) (i) By using Newton's divided difference formula find $f(8)$, given (8)

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

(ii) Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(3)$ for the following values of x and y: (8)

x	0	1	2	5
y	2	3	12	147

13. (a) (i) Evaluate $\int_1^2 \frac{dx}{1+x^3}$ using 3 point Gaussian formula. (8)

(ii) The velocity v of a particle at a distance a from a point on its path is given by the table : (8)

$s\ (ft)$	0	10	20	30	40	50	60
$v(ft/sec)$	47	58	64	65	61	52	38

Estimate the time taken to travel 60 feet by using Simpson's $\frac{1}{3}$ rule.

Compare the result with Simpson's $\frac{3}{8}$ rule.

Or

(b) (i) Evaluate $\int_0^1\int_0^1 \frac{1}{1+x+y}\,dx\,dy$ by trapzoidal rule. (8)

(ii) Evaluate $\int_0^1 \frac{dx}{1+x}$ and correct to 3 decimal places using Romberg's method and hence find the value of $\log_e 2$. (8)

14. (a) (i) Using Taylor's series method, find y at $x=0$ if $\frac{dy}{dx}=x^2y-1, y(0)=1$. (6)

(ii) Given $5xy'+y^2=2$, $y(4)=1$, $y(4.1)=1.0049$, $y(4.2)=1.0097$, $y(4.3)=1.0143$. Compute $y(4.4)$ using Milne's method. (10)

Or

(b) (i) Apply modified Euler's method to find $y(0.2)$ and $y(0.4)$ given $y'=x^2+y^2$, $y(0)=1$ by taking $h=0.2$. (6)

(ii) Given $y''+xy'+y=0, y(0)=1, y'(0)=0$ find the value of $y(0.1)$ by Runge-Kutta's method of fourth order. (10)

15. (a) By iteration method, solve the elliptic equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ over a square region of side 4, satisfying the boundary conditions.

(i) $u(0,y)=0, 0\le y\le 4$

(ii) $u(4,y)=12+y, 0\le y\le 4$

(iii) $u(x,0)=3x, 0\le x\le 4$

(iv) $u(x,4)=x^2, 0\le x\le 4$

By dividing the square into 16 square meshes of side 1 and always correcting the computed values to two places of decimals, obtain the values of u at 9 interior pivotal points. (16)

Or

(b) Solve by Crank-Nicolson's method $\frac{\partial^2 u}{\partial x^2}=\frac{\partial u}{\partial t}$ for $0<x<1, t>0$ given that $u(0,t)=0$, $u(1,t)=0$ and $u(x,0)=100x(1-x)$. Compute u for one time step with $h=\frac{1}{4}$ and $K=\frac{1}{64}$. (16)

Reg. No. :

Question Paper Code : 71776

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Sixth Semester

Computer Science and Engineering

MA 2264/MA 41/MA 51/MA 1251/080280026/10177 MA 401/10144 CSE 21/ 10144 ECE 15 — NUMERICAL METHODS

(Common to Sixth Semester – Electronics and Communication Engineering Industrial Engineering and Information Technology, Fifth Semester – Polymer Technology, Chemical Engineering and Polymer Technology, Fourth Semester – Aeronautical Engineering, Civil Engineering, Electrical and Electronics Engineering and Mechatronics Engineering)

(Regulation 2008/2010)

Time : Three hours　　　　Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Arrive a formula to find the value of $\sqrt{N}, (N > 0)$ using Newton-Raphson method.

2. Write the procedure involved in Gauss Jordan elimination method.

3. Show that $\underset{bcd}{\Delta^3}\left(\frac{1}{a}\right) = -\frac{1}{abcd}$.

4. What are the advantages of cubic spline fitting?

5. What are the errors in Trapezoidal and Simpson's rules of numerical integration?

6. State three point Gaussian quadrature formula.

7. State the advantages of RK-method over Taylor series method.

8. Using Euler's method find $y(0.2)$ from $\frac{dy}{dx} = x + y$, $y(0) = 1$, with $h = 0.2$.

9. Write the finite difference approximations of $y'(x)$ and $y''(x)$.

10. State standard five point formula.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Solve the equation $x \log_{10} x = 1.2$ using Newton's method. (8)

(ii) Solve the equations using Gauss-Seidal iterative method
$4x + 2y + z = 14,$
$x + 5y - z = 10$ and
$x + y + 8z = 20.$ (8)

Or

(b) (i) Find the inverse of the following matrix Gauss Jordan method:
$$\begin{bmatrix} 2 & 2 & 6 \\ 2 & 6 & -6 \\ 4 & -8 & -8 \end{bmatrix}.$$ (8)

(ii) Find all the eigen values of $A = \begin{pmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{pmatrix}$ using power method. (8)

12. (a) (i) Fit a Lagrange polynomial to the data:

x:	1	2	3	5
y:	0	1	26	124

and hence find y when $x = 3.5$. (8)

(ii) From the following data, find θ at $x = 43$ and $x = 84$

x:	40	50	60	70	80	90
θ:	184	204	226	250	276	304

Also express θ interms of x. (8)

Or

(b) (i) Using Newton's divided difference formula find $f(3)$ from the data: (8)

x:	0	1	2	4	5
$f(x)$:	1	14	15	5	6

(ii) Estimate sin 38° from the data given below: (8)

x:	0°	10°	20°	30°	40°
$\sin x$:	0	0.17365	0.34202	0.5	0.64279

13. (a) (i) Find the value of sec 31° using the following data: (8)

θ (in degrees):	31°	32°	33°	34°
$\tan\theta$:	0.6008	0.6249	0.6494	0.6745

(ii) Evaluate $\int_1^2\int_1^2 \frac{dx\,dy}{x^2 + y^2}$ with $h = 0.2$ along x-direction and $k = 0.25$ along y-direction. (8)

Or

(b) (i) Evaluate $\int_{0.2}^{1.5} e^{-x^2}\,dx$ using three point Gaussian quadrature formula. (8)

(ii) Using Romberg's method evaluate $\int_0^1 \frac{dx}{1+x}$ correct to three decimal places. (8)

14. (a) (i) Solve $y' = x + y; y(0) = 1$ by Taylore series method. Find the values of y at $x = 0.1$ and $x = 0.2$. (8)

(ii) Given $\frac{dy}{dx} = x^2(1+y)$, $y(1) = 1, y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.979$, evaluate $y(1.4)$ by Adam's-Bashforth method. (8)

Or

(b) (i) Using R-K method of fourth order solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2$. (8)

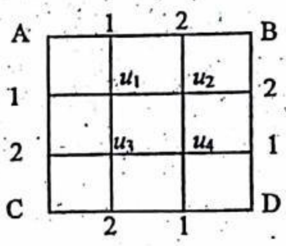
(ii) Using Milne's method find $y(4.4)$ given $5xy^1 + y^2 - 2 = 0$, $y(4) = 1$, $y(4.1) = 1.0049, y(4.2) = 1.0097, y(4.3) = 1.0143$. (8)

15. (a) (i) Solve $y'' - y = 0$, with $y(0) = 0, y(1) = 1$ using finite difference method with $h = 0.2$. (8)

(ii) Solve $y_{tt} = y_{xx}$ upto $t = 0.5$ with a spacing of 0.1 subject to $y(0,t) = 0 = y(1,t)$, $y_t(x,0) = 0$ and $y(x,0) = 10 + x(1-x)$ (8)

Or

(b) (i) Solve $u_{xx} + u_{yy} = 0$, for the following square mesh with boundary condition as shown below. Iterate until the maximum difference between successive values at any grid point is less than 0.001. (8)



(ii) Given $\frac{\partial^2 f}{\partial x^2} = \frac{\partial f}{\partial t}, f(0,t) = 0 = f(5,t),\ f(x,0) = x^2(25 - x^2)$, find f in the range taking $h = 1$ and upto 5 seconds. (8)