St. Joseph's College of Arts and Science, Cuddalore.

Question Bank

PG Research Department of Mathematics

Class: IB.Sc Mathematics

Subject Name: Numerical Methods

Subject Code: MT204S

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Semester: II

NUMERICAL METHODS

UNIT-1

2 Marks

1. Prove that $\Delta \log f(x)=\log\left[1+\frac{\Delta f(x)}{f(x)}\right]$

2. Prove that $\mu=\frac{E^{1/2}+E^{-1/2}}{2}$ and $\delta=E^{1/2}-E^{-1/2}$

3. Prove that $\Delta=\frac{1}{2}\delta^2+\delta\sqrt{1+\frac{\delta^2}{4}}$

4.Evaluate: $\left(\frac{\Delta^2}{E}\right)e^x.\frac{Ee^x}{\Delta^2 e^x}$

5. Explain the differences between $\left(\frac{\Delta^2}{E}\right)U_x$ and $\frac{\Delta^2 Ux}{EUx}$

6. Evaluate $\Delta[x(x+1)(x+2)(x+3)]$

7. Evaluate $\Delta(tan^{-1}x)$

8. Express f(x)=$x^2 + x + 1$ into factorial polynomial.

9. Write the formula for Newton's forward interpolation formula.

10. Given the following values for x and y. Find $\Delta^3 y_o$

X	0	1	2	3	4	5
Y	3	12	81	200	100	8

11. Write the formula for Newton's Backward Interpolation formula.

5 Mark

1. Write the type of operators and explain.
2. Express $f(x) = x^4 - 5x^3 + 3x + 4$ in terms of factorial polynomial.
3. Represent the function $f(x) = x^4 - 12x^3 + 24x^2 - 30x + 92$ its

   successive difference in factorial notation.

4. Find the missing y_x values in the table from the first differences provided.

y_x	0	?	?	?	?	?
Δy_x	0	1	2	4	7	11

5. Apply
   Newton's backward formula to find a polynomial degree of 3, which includes the following x,y pairs.

x	3	4	5	6
y	6	24	60	120

6. The values of x and y are given as below

x	5	6	7	8

y	12	13	14	16

Find the value of y when x=10.

7.Using Newton's forward interpolation formula find y at x=8 from the table:

X	0	5	10	15	20	25
Y	7	11	14	18	24	32

8.The following table gives corresponding values of x and y. From the difference table express y as a function of x.

X	0	1	2	3	4
Y	3	6	11	18	27

9. Given

x	0	4	8	12
f(x)	143	158	177	199

Find f(5), using Bessel's formula.

10 Mark

1. The function f(x) is given by the following table. Find f(0.2) by a suitable formula.

x	0	1	2	3	4	5	6
f(x)	176	185	194	203	212	220	229

2. The following table gives the population of a town during the last six census estimate using newton's forward interpolation formula, the increasing in the population during the period 1946 to 1948.

Year	1911	1921	1931	1941	1951	1961
Population (in thousands)	12	13	20	27	39	52

3. Find the value of $e^{1.85}$ given

$e^{1.7} = 5.4739,\ e^{1.8} = 6.0496,\ e^{1.9} = 6.6859, e^{2.0} = 7.3891,\ e^{2.1} = 8.1662,\ e^{2.2} = 9.0250, e^{2.3} = 9.9742.$

4. Using newton forward formula, find sin(0.1604) from the following table:

X	0.160	0.161	0.162
Sinx	0.1593182066	0.1603053541	0.1612923412

5. In a certain town, the values of x and y were found as follows:

x	0	1	2	3	4	5	6
f(x)	0	1	16	81	256	605	1296

Find the value of the y, when x=2.55 using newton's interpolation formula.

6. If the following table values of a function at equal interval:

x	0.0	0.5	1.0	1.5	2.0

f(x)	0.3989	0.3521	0.2420	0.1295	0.0540

Evaluate f(1.8).

7. Given the table,

x	0	0.1	0.2	0.3	0.4
e^x	1	1.1052	1.2214	1.3499	1.4918

Find the value of y=e^x when x=0.38.

8. From the given table compute the value of the $\sin 38^\circ$

x	0	10	20	30	40
Sinx	0	0.17365	0.34202	0.50000	0.64279

9. The following indicate a table of values taken from a record. Find the values of y at x=1.05. Use Newton's forward interpolation formula.

x	1.0	1.1	1.2	1.3	1.4	1.5
y	0.841	0.891	0.932	0.964	0.985	1.015

10. Applying Newton's interpolation formula, compute the value of $\sqrt{5.5}$, given that $\sqrt{5} = 2.236$, $\sqrt{6} = 2.449$, $\sqrt{7} = 2.646$ and $\sqrt{8} = 2.828$, correct upto three places of decimal.

11. A function f(x) is given by the following table. Find f(0.2).

x	0	1	2	3	4	5	6
f(x)	176	185	194	203	212	220	229

12. Find the expectation of life at age 32 from the following data:

Age	10	15	20	25	30	35
Expectation of life	35.3	32.4	29.2	26.1	23.2	20.5

13.The following table gives the census population of a town for the years 1931 to 1971. Estimate the population for the year 1965 by using an appropriate interpolation formula.

Year	1931	1941	1951	1961	1971
Population (in thousands)	46	66	81	93	101

14.Using Bessel's formula, find f(46.24).

X	41	45	49	53
f(x)	3.4482	3.5569	3.6593	3.7563

15. Using Bessel's formula, find the value of y at x=1.95 given that

X	1.7	1.8	1.9	2.0	2.1	2.2	2.3
Y	2.979	3.144	3.283	3.391	3.463	3.997	4.491

UNIT - 2

2-MARKS

1. Write the formula for Central difference operator.

2. Write the formula for Gauss Forward formula.

3. Write the formula for Gauss Backward interpolation formula.

4. Write the formula for Stirling formula.

5. Write the formula for Bessel's formula

5-MARKS

1.Using Gauss Backward formula find the population in the year 1966 given that

Year	1931	1941	1951	1961	1971	1981
Population (in crores)	12	15	20	27	39	52

2. Using striling formula to find y_{35} given

X	Y_{20}	Y_{30}	Y_{40}	Y_{50}
f(x)	512	439	346	243

3. Find f(5) using Bessel's formula, given

X	0	4	8	12
f(x)	143	158	177	199

4. Use Bessel's formula to find f(25) given that f(20)=24, f(24)=32, f(28)=35, f(32)=40.

5. Use Gauss's forward formula to find f(30) from the following data.

X	21	25	29	33	37
f(x)	18.4708	17.8144	17.1070	16.3432	15.5154

6. Apply any central difference formula to obtain f(25) given that f(20)=14, f(24)=32, f(28)=35, f(32)=40

7. Given

x	0	4	8	12
f(x)	143	158	177	199

Find f(5) Using Bessel's formula.

10 MARKS

1.Using Gauss interpolation formula find f(3.5) from the following table:

X	2	3	4	5
Y	2.626	3.454	4.784	6.986

2. Find f(3.75) from the table using Gauss forward formula:

X	2.5	3.0	3.5	4.0	4.5	5.0
f(x)	24.145	22.043	20.225	18.644	17.262	16.047

3. Using Gauss forward formula find f(30) from the following table:

X	21	25	29	33	37
f(x)	18.4708	17.8144	17.1070	16.3432	15.5154

4. Using Gauss Backward formula find $\sin 45^\circ$ from the following type.

X	20	30	40	50	60	70
Sinx	0.34202	0.502	0.64279	0.76604	0.86603	0.93969

5. Using Gauss Backward forward formula find $\tan 16^\circ$ from the following type

X	0	5	10	15	20	25	30
Tanx	0	0.0875	0.1763	0.2639	0.3640	0.4663	0.5774

6. The following table gives the values of the probability integral $f(x) = \frac{2}{\sqrt{\pi}} \int_0^{\infty} e^{-x^2} dx$ for certain values of x. Find the value of this integral then x=0.5437.
7. Using Bessel's formula find f(25) given f(20)=2854, f(24)=3162, f(28)= 3544, f(32)= 3992.
8. Using Bessel's formula find f(46.24)

X	41	45	49	53
f(x)	3.4482	3.5569	3.6593	3.7563

9. Using Bessel's formula find the value of y at x=1.95, given that

X	1.7	1.8	1.9	2.0	2.1	2.2	2.3
Y	2.979	3.144	3.283	3.391	3.465	3.997	4.491

10.Use Stirling's formula to evaluate f(1.22) given:

x	1.0	1.1	1.2	1.3	1.4
f(x)	0.841	0.891	0.932	0.963	0.985

11.Given

X	0	5	10	15	20	25	30
tan x	0	0.0875	0.1763	0.2639	0.3640	0.4663	0.5774

Find $\tan 16^0$

12.Using Bessel's formula, find f(46.24)

x	41	45	49	53
f(x)	3.4482	3.5569	3.6593	3.7563

13.Using Bessel's formula find the value of y at x=1.95 given that

X	1.7	1.8	1.9	2.0	2.1	2.2	2.3
Y	2.979	3.144	3.283	3.391	3.463	3.997	4.491

UNIT-3
2 MARKS

1. Define Divided differences.

2 . Write the formula for Newton's Divided Difference formula.

3. Write the formula for Lagrange's interpolation formula for unequal intervals.

4. Write the formula for Inverse Lagrange's interpolation formula.

5. Estimate y from the following table.

X	1	2	3	4	5
Y	7	?	13	21	37

6. Find the missing values from table:

X	1	2	3	4	5
Y	2	5	7	?	32

5 MARKS

1.Construct a table of divided differences for the following data:

X	0	2	3	5	6
f(x)	1	19	55	241	415

2. Find the Cubic function from the following table using Newton's divided difference formula.

X	0	1	2	3
f(x)	1	4	40	85

3. Using Lagrange's interpolation formula to find y when x=5, from the following data.

X	0	1	3	8
Y	123	13	3	1

4. Using Lagrange's find the value of x when f(x)=15 from the given data.

X	5	6	9	11
Y	12	13	14	16

5. Find the missing value from the table.

X	0	5	10	15	20	25
Y	6	10	?	17	?	31

6. Find the missing value of the table.

X	0	5	10	15	20	25
Y	6	10	A	17	B	31

7. Construct a table of divided difference for the following data.

X	2	5	8	10	12
Y	4.4	6.2	6.7	7.5	8.7

8. Construct a table of divided difference for the following data:

X	0	2	3	5	6
Y	1	19	55	241	415

9. Given $y_{0/} = -12, y_1 = 0, y_3 = 6$ and $y_4 = 12$. Find y_2 using Newton's formula.

10. Find f(8) from the following table.

X	4	5	7	10	11	13
Y	48	100	294	900	1210	2028

11. Use Lagrangian interpolation formula to find the value of y at x=3.5, with the following data of x and y.

X	1	3	5
Y	1.5708	1.5719	1.5738

12. Use Lagrange's interpolation formula to find y when x=5 from the following data:

X	0	1	3	8
Y	1	3	13	123

13. Using Lagrange's formula fond the value of x when f(x)=15 from the given data.

X	5	6	9	11
Y	12	13	14	16

14. Find the value of x corresponding to y=100 from the table.

X	3	5	7	9	11
Y	6	24	58	108	174

10 MARKS

1. Given $\log_{10} 654=2.8156$, $\log_{10} 658=2.8182$, $\log_{10} 659=2.8189$ and $\log_{10} 661=2.8202$. Find the value of $\log_{10} 656$ using newton's divided difference formula.
2. Find f(8) from the following table:

X	4	5	7	10	11	13
Y	48	100	294	900	1210	2028

3. Using Lagrange's interpolation formula find the value corresponding to x=10 from the following table:

X	5	6	9	11
Y	12	13	14	16

4. Apply Lagrange's formula to find f(x) from the following data:

X	0	1	4	5
f(x)	4	3	24	39

5. Using Lagrange's formula find the form of the function f(x) given that

X	0	2	3	6
f(x)	659	705	729	804

6. Using Lagrange's formula and find $\log_{10}656$ from $\log_{10}654=2.8156$, $\log_{10}658=2.8182$, $\log_{10}659=2.8189$, $\log_{10}661=2.8202$.

7. Find the value of x then y=85 using lagrange's formula from the following data.

X	2	5	8	14
Y	94.8	87.9	81.3	68.7

8. Find the value of $\emptyset$ if $f(\emptyset) = 0.3887$ from the given table.

$\emptyset$	21°	23°	25°
$f(\emptyset)$	0.3706	0.4068	0.4433

9. Find f(19) using Newton's divided difference formula.

X	11	17	21	23
Y	14646	83526	194486	279846

10. Find the function f(x) from the following table:

X	0	1	4	5
Y	8	11	78	123

11. Using Lagrange's formula for interpolation find the value of f(4) form the following table.

X	0	2	3	6
f(x)	-4	2	14	158

12. Interpolate the value of y at x=5, using Lagrange's interpolation method, from the following data.

X	1	2	3	4	7
Y	2	4	8	16	128

13. Given $\log_{10} 654 = 2.8156, \log_{10} 658 = 2.8182, \log_{10} 659 = 2.8189, \log_{10} 661 = 2.8202$ find $\log_{10} 656$.

14. Find the value of x corresponding to y=12, using Lagrange's inverse formula from the following table..

X	1.2	2.1	2.8	4.1	4.9	6.2
Y	4.2	6.8	9.8	13.4	15.5	19.6

15. Find the value of ϕ if F(ϕ)=0.3887 from the table given below:

ϕ	21^0	23^0	25^0
F(ϕ)	0.3706	0.4068	0.4433

UNIT-4
2 MARKS

1. What is meant by Diagonally dominant.
2. Write the sufficient condition for convergence of Gauss-Siedal method.
3. Write a short notes on Crout's method.
4. Solve the linear system $x_1 - 4x_2 = -2, 3x_1 + x_2 = 7$ by Jordan method.
5. Solve the following by Gauss-Jordan method 2x+y=3, 7x-3y=4.
6. Arrange the following system of equations diagonally dominant.
   3x+9y-2z=10
   4x+2y+3z=19
   4x-2y+z=3

7. Solve the following equations by Gauss-Elimination method.
   $2x+y=3$
   $7x-3y=4$.

5 MARKS

1. Explain the Gauss Elimination method.
2. Explain the Gaussian method.
3. Explain Gauss Jordan method.
4. Explain Crout's method.
5. Explain Gauss-Seidel interative method.
6. Using gauss elimination method, solve the equations $3x_1+x_2+x_3=4$; $x_1+4x_2-x_3=-5$; $x_1+x_2-6x_3=-12$.

10 MARKS

1. Solve the following system by Gaussian elimination method:
$x_1-x_{2+}x_3=1$, $-3x_1+2x_2-3x_3=-6$, $2x_1-5x_2+4x_3=5$
2. Find the inverse of a matrix using Gaussian elimination method $\begin{bmatrix}2 & 1 & 1\\3 & 2 & 3\\1 & 4 & 9\end{bmatrix}$
3. Find the inverse of matrix using Gaussian method $\begin{bmatrix}2 & 4 & 3\\0 & 1 & 1\\2 & 2 & -1\end{bmatrix}$
4. Find the inverse of matrix $\begin{bmatrix}3 & 2 & 4\\2 & 1 & 1\\1 & 3 & 5\end{bmatrix}$ using Gaussian method.
5. Solve the following system by Gaussian elimination method,
$3x+y-z=3$, $2x-8y+z=-5$, $x-2y+9z=8$
6. Using the gauss Jordan method solve the following equations.$10x+y+z=12$, $2x+10+z=13$, $x+y+5z=7$.
7. Using the gauss Jordan method solve the following equations.
   $2x+4y+z=3$, $3x+2y-2z=-2$, $x-y+z=6$.

8. Solve the following equations using gauss Jordan method.
$2x_1+2x_2-x_{3+}x_4=4$, $4x_1+3x_2-x_3+2x_4=6$, $8x_1+5x_2-3x_3+4x_4=12$, $3x_1+3x_2-2x_3+2x_4=6$
9. By Crouts method obtain the solution of the system of equations
x+3y+8z=4, x+4y+3z=-2, x+3y+4z=1.
10. Solve the following equations by Crouts method.
2x+y+4z=122, 8x-3y+2z=20, 4x+11y-z=33.
11. Using gauss seidal iterative method. Solve the system of equations $10x_1-2x_2-x_3-x_4=3$, $-2x_1+10x_2-x_3-x_4=15$, $-x_1-x_2+10x_3-2x_4=27$, $-x_1-x_2-2x_3+10x_4=-9$
12. Solve the system of equations 8x-y+z-18=0, 2x+5y-2z-3=0, x+y+3z+6=0
13. Solve the following system of equations using gauss elimination method.
10x+y+z=18.141, x+y+10z=38.139, x+10y+z=28.140
14. Solve the following system of equation using gauss elimination method.
$x_1+x_2+x_3+x_4=2$, $x_1+x_2+3x_3-2x_4=-6$, $2x_1+3x_2-x_3+2x_4=7$, $x_1+2x_2+x_3-x_4=-2$
15. Find the inverse of the following matrices using Gaussian method. $\begin{bmatrix}3 & 1 & 2\\ 2 & 5 & 3\\ 1 & 2 & 1\end{bmatrix}$

16. Using the gauss Jordan method, solve the following equations:
$2x_1+x_2+4x_3=4$; $x_1-3x_2-x_3=-5$; $x_1-3x_2-x_3=-5$; $3x_1-2x_2+2x_3=-1$.
17. Using the gauss Jordan method, solve the following equations:x+2y+z=8, 2x+3y+4z=20, 4x+3y+2z=16.
18. Solve the following equations by Crout's method.
2x-6y+8z=24, 5x+4y-3z=2, 3x+y+2z=16
19. Solve the following equations by crout's method.
2x+4y-2z=14, x+3y-4z=16, -x+2y+3z=1.
20. Find the inverse of the following matrices using Gaussian method. $\begin{bmatrix}1 & 0 & -1\\ 3 & 4 & 5\\ 0 & -6 & -7\end{bmatrix}$

21. Solve the system of equations using jacobians method: 28x+4y-z=32, x+3y+10z=24, 2x+17y+4z=35

22. Solve the following systems of equations using Gauss-elimination method.

$2x_1+4x_2+2x_3=15$

$2x_1+x_2+2x_3=-5$

$4x_1+x_2-2x_3=0$

23. Solve the following systems of equations using Gauss-elimination method.

10x+y+z=18.141

x+y+10z=38.139

x+10y+z=28.140

24. Solve the following systems of equations using Gauss-elimination method.

$x_1+x_2+x_3+x_4=2$

$x_1+x_2+3x_3-2x_4=-6$

$2x_1+3x_2-x_3+2x_4=7$

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

25. Using Gauss –Jordan method, solve the following equations.

$2x_1+x_2+4x_3=4$

$x_1-3x_2-x_3=-5$

$3x_1-2x_2+2x_3=-1$

26. Using Gauss –Jordan method, solve the following equations.

2x+y+5z+t=5

x+y-3z+4t=-1

3x+6y-2z+t=8

2x+2y+2z-3t=2

27. Solve the following equations by Crout's Method.

3x+2y+7z=4

2x+3y+z=5

3x+4y+z=7

28. Solve the following equations by Crout's Method.

2x+4y-2z=14

x+3y-4z=16

-x+2y+3z=1

29. Solve the following system of equations using Gauss-Seidal iteration method.

$9x_1 + 2x_2 + 4x_3 = 20$

$x_1 + 10x_2 + 4x_3 = 6$

$2x_1 - 4x_2 + 10x_3 = -15$

30. Solve the following system of equations using Gauss-Seidal iteration method.

$3x + 4y + 5z = 54.8$

$x + 12y + 3z = 39.66$

$10x + y - 2z = 7.74$

31. Solve the following system of equations using Gauss-Seidal iteration method.

$27x_1 + 6x_2 - x_3 = 85$

$6x_1 + 15x_2 + 2x_3 = 72$

$x_1 + x_2 + 54x_3 = 110$

32. Find the inverse of the following matrices using Gaussian method.

$$\begin{pmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{pmatrix}$$

33. Find the inverse of the following matrices using Gaussian method.

$$\begin{pmatrix} 2 & 4 & 3 \\ 0 & 1 & 1 \\ 2 & 2 & -1 \end{pmatrix}$$

UNIT-5

2 **MARKS**

1. Write the formula for second order Runge Kutta method.

3. Write the formula for Trapezoidal Rule.

4. Write the formula for Simpson's $\frac{1}{3}^{rd}$ rule.

5. Write the formula for Simpson's $\frac{3}{8}^{th}$ rule.

6. Write the formula for Euler's improved method.

7. Write the formula for Euler's modified method.

5 MARKS

1. Compute the value of the definite integral $\int_4^{5.2} \log_e x dx$ or $\int_4^{5.2} \ln x dx$ using
   (i) Trapezoidal rule (ii) Simpson's rule.
2. Evaluate $\int_0^1 e^{-x^2} dx$ by dividing the range of integration into 4 equal parts using (i) Trapezoidal rule, (ii)Simpson's rule.
3. Evaluate $\int_0^1 dx / 1+x^2$, using Trapezoidal rule with h=0.2. Hence determine the value of π.
4. Find the value of $\log 2^{\frac{3}{2}}$ from $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson's $\frac{1}{3}$ rule with h=0.25.
5. Using Trapezoidal rule evaluate $\int_{0.6}^{2} y dx$ from the following table.

x	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
y	1.23	1.58	2.03	4.32	6.25	8.36	10.23	12.45

6. Given $e^0=1,\ e^1=2.72, e^2=7.39, e^3=20.09, e^4=54.60$. Use Simpson's rule to find an approximate value of $\int_0^4 e^x dx$. Also compare your result with the exact value of the integral.
7. The Velocity V of a particle at distance 's' from a point on its path is given by the table:

t	0	10	20	30	40	50	60	Feet
V	47	58	64	65	61`	52	38	Feet/sec

Estimate the time taken to travel 60 feet by using Simpson's one-third rule. Compare the result with Simpson's $\frac{3}{8}$ rule.

8. Evaluate $\int_{0.2}^{1.4} (\sin x - \ln x + e^x) dx$ by simpson's $\frac{1}{3}$ rule.

9. Using the following data, evaluate $\int_1^7 f(x)dx$ by (i) Trapezoid rule, (ii) Simpson's rule.
10. Given $\frac{dy}{dx} + y - x^2 = 0$, y(0)=1, y(0.1)=0.9052, y(0.2)=0.8213, find correct to four decimal places y(0.3) using modified Euler's method.
11. Given $\frac{dy}{dx} = x + y^2$ and y(0)=1. Find an approximate value of y at x=0.5 by modified Euler's method. Taking h=0.1.

10 MARKS

1. By applying the 4th order Runge Kutta method find y(0.2) from y'=y-x, y(0)=2, taking h=0.1.
2. Using Runge Kutta method of fourth order: $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0)=1 at x=0.2,0.4
3. Using the data given below, find the value of (a) $\int_1^9 ydx$ by Simpson's rule. (b) $\int_1^9 ydx$ by Trapezoidal rule.
4. Solve $\frac{dy}{dx} = \frac{2y}{x} + x^3$ to obtain y(1.2) and y(1.4) given y=0.5 when x=1 by modified Euler's method.
5. Using modified Euler's method, solve $\frac{dy}{dx} = y + x^2$, y(0)=1 to find y(0.2) and y(0.4) correct to 3 decimals.
6. Using modified Euler's method, Obtain the solution of the following at x=0.2 and 0.4, taking h=0.2, $\frac{dy}{dx} = x - y^2$, y(0)=1.
7. Given $\frac{dy}{dx} - x^2 - y = 4$, y(0)=1. Determine y(0.02), y(0.04) and y(0.06) using Euler's modified method.
8. Solve the differential equation $\frac{dy}{dx} = -xy^2$, y(0)=2 by modified Euler's method and obtain y(0.2) by taking h=0.1.

9. By applying the fourth order Runge-Kutta Method find y(0.2) from y'=y-x, y(0)=2 taking h=0.1.
10. Using Runge-Kutta Method of fourth order, solve for y at x=1.2, 1.4 from $\frac{dy}{dx}=\frac{2xy+e^x}{x^2+xe^x}$ with x_0=1, y_0=0.
11. Using Runge-Kutta 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, 0.4.
12. Using Runge-Kutta Method of fourth order determine correct to 3 decimal places the value of y at x=0.1, 0.2 if y satisfies the equation $\frac{dy}{dx}-x^{2y}=x$, y(0)=1.
13. Using Runge-Kutta Method to approximate y, when x=0.1, 0.2, 0.3, h=0.1 given x=0 when y=1 and $\frac{dy}{dx}=x+y.$
14. Using Runge-Kutta Method of fourth order, find y(0.1) and y(0.2) correct to four places of decimals if $(y+x)\frac{dy}{dx}=y-x^2$, y(0)=1.
15. Find y(0.2) and y(0.4) for $\frac{dy}{dx}=x+y.$, y(0)=1 taking h=0.2 by Runge-Kutta method of order four.
16. Using the Runge-Kutta method, tabulate the solution of the system $\frac{dy}{dx}=x+z, \frac{dy}{dx}=x-y$, y=0, z=1 when x=0 at intervals of h=0.1 from x=0.0 to x=0.2.
17. Solve the system of differential equations at x=0.1 $\frac{dy}{dx}=y-t, \frac{dy}{dx}=x+t$ with x=1, y=1 when t=0 taking h=0.1. Using Runge-Kutta method.
18. Solve the system of differential equations at x=0.1, $\frac{dy}{dx}=x+z, \frac{dy}{dx}=x+z, \frac{dz}{dx}=x-y^2$ given that y=2, z=1 when x=0.
19. Solve the differential equations $\frac{dy}{dx}=1+xz, \frac{dz}{dx}=-xy$ for x=0.3 using fourth order Runge-Kutta method. Initial values are x=0, y=0, z=1.
20. Solve $\frac{d^2y}{dx^2}-x\left(\frac{dy}{dx}\right)^2+y^2=0$ using Runge-Kutta method for x=0.2 correct to 4 decimal places. Initial conditions are x=0, y=1, y'=0.

21. Using Runge-Kutta method find y when x=0.1, given that $\frac{d^2y}{dx^2} + 2x\left(\frac{dy}{dx}\right) - 4y = 0$ and y=0.2, $\frac{dy}{dx} = 0.5$ when x=0.

22. Find y(0.1) from $\frac{d^2y}{dx^2} - y^3 = 0$, y(0)=10, y'(0)=50. Using Runge-Kutta method.

23. Given $\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right) + y = 0$, y(0)=1, y'(0)=0. Find y(0.1) and y(0.2) using Runge-Kutta method.

24. Using Adam's method find y(0.4) given y'=$\frac{xy}{2}$, y(0.1)=1.01, y(0.2)=1.022, y(0.3)=1.023.

25. Solve the initial value problem $\frac{dy}{dx} = x - y^2$, y(0)=1 to find y(0.4) by Adam's method. Starting solutions required are to be obtained using Runge-Kutta method of fourth order using step value h=0.1.

26. Using Adam's method determine y(0.4) and y(0.5) correct to 3 decimals given that $\frac{dy}{dx} = 0.5xy$ and y(0), y(0.1), y(0.2) and y(0.3) have values 1.0, 1.0025, 1.0101 and 1.0228 respectively.

27. Obtain the solution of the initial value problem by Adam's method at y(1.4) given $\frac{dy}{dx} - x^2y = x^2$, y(1)=1, y(1.1)=1.233, y(1.2)=1.548, y(1.3)=1.979.

28. Given $\frac{dy}{dx} = x^2 - y$, y(0)=1 and y(0.1)=0.90516, y(0.2)=0.82127, y(0.3)=0.74918 obtain the value of y(0.4) and y(0.5) using Adam's method.