Semester - IV **060090403- CC10 Numerical Analysis**

Question Bank

Unit-1 Curve Fitting

[A] 5 – Marks Questions

1. Fit a linear curve to given data below and find y (110).

x	2	6	12	34	45	67	86	90
y	1222	1450	1342	1257	1500	1546	800	234

2. Fit a weighted linear curve to given data below and find y (90).

x	12	17	20	34	50	75	80	82
y	12.3	24.5	12.6	10.8	42.3	23.5	34.5	21.5

3. Fit a linear curve to given data below and find y (150).

x	10	15	35	45	55	65	85	95	115	125
y	22	34	25	16	25	60	78	54	23	12

4. Fit a linear curve to given data below and find y (125).

x	12	34	36	47	58	80	98	115
y	122	145	134	257	500	546	800	934

5. Fit a linear curve to given data below and find y (90).

x	12	17	20	34	50	75	80	82
y	12.323	24.512	12.635	10.812	42.377	23.502	34.512	21.532

6. Fit a linear curve to given data below and find y (1050).

x	100	151	350	452	551	653	852	950
y	2	4	5	6	15	6	8	5

7. Fit a weighted linear curve to given data below and find y (10).

x	1	2	3	4	5	6	7	8
y	3	4	7	12	21	32	45	56
w	1	1	5	4	2	1	2	1

8. Fit a weighted linear curve to given data below and find y (40).

x	10	15	20	25	30	35
y	1	4	6	8	5	2
w	1	2	2	2	1	2

9. Fit a weighted linear curve to given data below and find y (10).

x	1	2	3	4	5	6	7	8
y	12	34	56	34	23	47	78	91
w	1	1	2	3	2	1	1	1

10. Fit a weighted linear curve to given data below and find y (40).

x	10	15	20	25	30	35
y	10	15	26	38	45	52
w	1	1	2	2	1	4

11. Fit a parabolic curve to given data below and find y (80).

x	10	20	30	40	50	60
y	4.5	7.1	10.5	15.5	20.5	27.1

12. Fit a parabolic curve to given data below and find y (20).

x	2	4	6	8	10	12	14	16
y	134	256	345	368	410	425	460	510

13. Fit a parabolic curve to given data below and find y (15).

x	2	4	6	8	10	12
y	1342	2560	3451	3684	4102	4251

14. Fit a parabolic curve to given data below and find y (25).

x	3	5	7	12	18	20
y	4.523	7.112	10.523	15.523	20.555	27.112

15. Fit a parabolic curve to given data below and find y (100).

x	10	20	30	40	50	60	70	80
y	0.1234	1.23461	3.451	2.3458	7.1235	2.3456	6.3422	5.3244

16. Fit a parabolic curve to given data below and find y (10).

x	1	2	3	4	5	6	7	8
y	0.123	1.234	3.451	2.345	7.123	2.345	6.342	5.324

17. Fit a curve of the form $y=ab^x$ to the data give below;

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	120	230	250	100	80	55	42	22	15	8

18. Fit a curve of the form $y=ab^x$ to the data give below;

x	1	2	3	4	5	6	7	8	9	10
y	12	23	25	10	8	35	34	23	1	18

19. Fit a curve of the form $y=ae^{bx}$ to the data give below;

x	25	50	60	72	88	93	105	117
y	10.88	23.12	24.21	12.11	18.99	20.32	45.22	13.22

20. Fit a curve of the form $y=ae^{bx}$ to the data give below;

x	1	2	3	4	5	6	7
y	1.2	2.3	4.6	7.3	4.3	3.2	5.5

21. Fit a curve of the form $y=ae^{bx}$ to the data give below;

x	1.2	1.4	2.6	2.8	3.4	3.7	4.2	4.5
y	1.223	1.452	1.873	2.000	2.134	1.456	2.492	2.336

22. Fit a curve of the form $y=ae^{bx}$ to the data give below;

x	12	34	56	63	76	82	98	110
y	1.88	2.12	4.21	1.11	8.99	2.32	5.22	3.22

23. Fit a curve of the form $y=ae^{bx}$ to the data give below;

x	10	20	30	40	50	60	70
y	1.222	2.314	4.643	7.312	4.356	3.200	5.523

24. Fit a curve of the form $y=ae^{bx}$ to the data give below;

x	1.2	1.4	2.6	2.8	3.4	3.7
y	1.2	1.4	1.8	2.0	2.1	1.4

25. Fit a curve of the form $y=ax^b$ to the data give below;

x	14	23	35	67	80	121	134

	y	2.2341	3.2124	4.2314	3.6783	3.245	4.5612	2.3589

26. Fit a curve of the form $y=ax^b$ to the data give below;

x	1	4	6	8	12	16	20
y	2.2341	3.2124	4.2314	3.6783	3.245	4.5612	2.3589

27. Fit a quadratic curve to the function $y=1/x$ on [1 , 3] with respect to the weight function w(x)=1.

28. Fit a quadratic curve to the function $y=2/x$ on [1 , 4] with respect to the weight function w(x)=1.

29. Fit a quadratic curve to the function $y=1/x^2$ on [1 , 4] with respect to the weight function w(x)=1.

30. Fit a quadratic curve to the function $y=3/x^2$ on [1 , 3] with respect to the weight function w(x)=1.

Unit-2 Numerical Differentiation and Integration

[A] 5 – Marks Questions

1. Find first and second order derivative of function tabulated below at x = 3.

x	3.0	3.2	3.4	3.6	3.8	4.0	4.2
f(x)	-14	-10.22	-5.324	-0.234	6.673	12.11	14.23

2. Find first and second order derivative of function tabulated below at x = 13.

x	1	3	5	7	9	11	13
f(x)	2.1348	3.2415	3.2456	4.1253	4.5678	5.0231	5.6832

3. Find first and second order derivative of function tabulated below at x = 0.3.

x	0.2	0.4	0.6	0.8	1.0	1.2	1.4
f(x)	-0.0023	0.1543	1.3421	1.5623	2.0021	2.4537	3.0212

4. Find first and second order derivative of function tabulated below at x = 26.

x	15	17	19	21	23	25	27
f(x)	3.6531	3.9834	4.1252	4.5637	4.8977	5.2341	5.7833

5. Find first and second order derivative of function tabulated below at x = 1.06.

x	0.96	0.98	1.00	1.02	1.04	1.06	1.08
f(x)	0.71241	7.4623	7.8832	0.7452	0.7649	0.7248	0.7732

6. Find first and second order derivative of function tabulated below at x = 30.

x	5	10	15	20	25	30	35
f(x)	-14.23	-10.25	-5.322	-0.2312	6.6723	12.114	14.231

7. Find first and second order derivative of function tabulated below at x = 13.

x	10	30	50	70	90	110	130
f(x)	2.13	3.24	3.26	4.12	4.56	5.02	5.68

8. Find first and second order derivative of function tabulated below at x = 3.30.

x	0.22	0.24	0.26	0.28	3.00	3.20	3.40
f(x)	-0.002	0.154	1.342	1.562	2.002	2.453	3.021

9. Find first and second order derivative of function tabulated below at x = 16.

x	5	7	9	11	13	15	17
f(x)	3.6	3.9	4.1	4.5	4.8	5.2	5.8

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10. Find first and second order derivative of function tabulated below at x = 10.3.

x	9.6	9.8	10	10.2	10.4
f(x)	0.71	7.46	7.88	0.74	0.76

11. Form the given data blow find y ' and y '' at x = 1.15.

x	1.00	1.05	1.10	1.15	1.20	1.25
y	3.375	7.0236	13.567	24.256	40.237	60.231

12. Form the given data blow find y ' and y '' at x = 1.78.

x	1.7	1.74	1.78	1.82	1.86
y	22	36	42	45	50

13. Form the given data blow find y ' and y '' at x = 31.

x	30	31	32	33	34	35
y	1	5	6	8	9	12

14. Form the given data blow find y ' and y '' at x = 3.

x	0	1	3	5	7
y	31.245	32.4532	33.2345	34.2312	35.3212

15. Form the given data blow find y ' and y '' at x = 5.

x	2	3	4	5	6	7
y	0.93	0.84	0.94	0.86	0.84	0.89

16. Form the given data blow find y ' and y '' at x = 0.15.

x	0	0.05	0.10	0.15	0.20	0.25
y	1.375	8.02	14.5	20.2	36.2	50.3

17. Form the given data blow find y ' and y '' at x = 7.8.

x	7.0	7.4	7.8	8.2	8.6
y	2.234	3.612	4.254	4.533	5.018

18. Form the given data blow find y ' and y '' at x = 3.1.

X	3.0	3.1	3.2	3.3	3.4	3.5
Y	11	15	26	28	39	52

19. Form the given data blow find y ' and y '' at x = 0.3.

x	0.0	0.1	0.3	0.5	0.7
y	3.5011	3.5634	3.6719	3.2362	3.3212

20. Form the given data blow find y ' and y '' at x = 15.

x	12	13	14	15	16	17
y	0.9324	0.8453	0.93425	0.8634	0.8457	0.8992

21. Evaluate $\int_1^2 \frac{1}{1+x^2}\,dx$ taking h=0.2, using Trapezoidal rule.

22. Evaluate $\int_1^2 \frac{sinx}{x}\,dx$ taking 6 equal intervals, using Trapezoidal rule.

23. Evaluate $\int_1^2 \frac{1}{x^2+2x-1}\,dx$ taking h=0.2, using Trapezoidal rule.

24. Evaluate $\int_1^2 \frac{cosx}{x^2}\,dx$ taking 6 equal intervals, using Trapezoidal rule.

25. Evaluate $\int_0^2 \frac{1}{x^2+x+1}\,dx$, using Simpson's rule.

26. Evaluate $\int_0^1 e^x\,dx$, taking h=0.25,using Simpson's rule.

27. Evaluate $\int_1^{1.4} e^{-x^2}\,dx$ taking h=0.1, using Simpson's rule.

28. Evaluate $\int_0^{\pi/2} e^{sinx}\,dx$ taking h=π/6, using Simpson's rule.

29.	Evaluate $\int_0^2 \frac{1}{x^2+4x}\,dx$, using Simpson's rule.
30.	Evaluate $\int_0^1 e^{-x^2}\,dx$, taking h=0.25, using Simpson's rule.
31.	Evaluate $\int_1^{1.4} e^{x^2}\,dx$ taking h=0.1, using Simpson's rule.
32.	Evaluate $\int_0^{\pi/2} e^{cosx}\,dx$ taking h=π/6, using Simpson's rule.
33.	Evaluate $\int_0^{\pi} cos^2x\,dx$ taking h = π/6, using Simpson's 3/8 rule.
34.	Evaluate $\int_0^{\pi} tan^3x\,dx$ taking h = π/6, using Simpson's 3/8 rule.
35.	Evaluate $\int_1^2 \frac{1}{x}\,dx$, taking h=0.5, 0.25 and 0.125,using Romberg rule.
36.	Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ taking h=1, ½, ¼ , using Romberg rule.
37.	Evaluate $\int_0^1 \frac{1}{x^2-1}\,dx$ taking h=0.5 0.25 and 0.125 , using Romberg rule.
38.	Evaluate $\int_1^2 \frac{1}{x^2}\,dx$, taking h=0.5, 0.25 and 0.125, using Romberg rule.
39.	Evaluate $\int_0^1 \frac{1}{1-x}\,dx$ taking h=1, ½, ¼ , using Romberg rule.
40.	Evaluate $\int_0^1 \frac{1}{x^3}\,dx$ taking h=0.5 0.25 and 0.125 , using Romberg rule.
41.	Evaluate $\int_1^2 \frac{1}{1+x}\,dx$ taking h=0.5, using Cubic Spline rule.
42.	Evaluate $\int_0^1 sin\pi x\,dx$ taking h=0.5, using Cubic Spline rule.
43.	Evaluate $\int_1^2 \frac{1}{1-x}\,dx$ taking h=0.5, using Cubic Spline rule.
44.	Evaluate $\int_0^1 cos\pi x\,dx$ taking h=0.5, using Cubic Spline rule.
45.	Evaluate $\int_1^3 sinx\,dx$ taking h=0.5, using Weddle's rule.
46.	Evaluate $\int_1^3 sinx^2\,dx$ taking h=0.5, using Weddle's rule.
47.	Evaluate $\int_4^{5.2} xlog_e x\,dx$ taking h=0.2, using Weddle's rule.
48.	Evaluate $\int_4^{5.2} log_e x^2\,dx$ taking h=0.2, using Weddle's rule.
49.	Evaluate $\int_5^{12} \frac{1}{x^2}\,dx$, using Boole's rule.
50.	Evaluate $\int_5^{12} \frac{1}{x^2+1}\,dx$, using Boole's rule.
Unit-3	**Numerical solution of Ordinary Differential Equation-Initial Value Problem**
[A]	**5 – Marks Questions**
1.	Given the differential equation $y' = x - y^2$ and y(0) = 1, use Taylor's series method to determine the value of y(0.1).
2.	Given the differential equation $y' = x^2y - 1$ and y(0) = 1, use Taylor's series method to determine the value of y(0.1).
3.	Given the differential equation $y' = 3x + \frac{1}{2}y$ and y(0) = 1, use Taylor's series method to determine the value of y(0.1) and y(0.2).
4.	Given the differential equation $y' = xy + y^2$ and y(0) = 1, use Taylor's series method to determine the value of y(0.1),y(0.2) and y(0.3).

5.	Given the differential equation $y' = x + \frac{1}{10}y^2$ and y(`1.8) = 0, use Taylor's series method to determine the value of y(2).
6.	Given the differential equation $y' = xy^2 + y$ and y(0) = 1, use Taylor's series method to determine the value of y(0.1) and y(0.2).
7.	Given the differential equation $y' = xy^2 + 1$ and y(0) = 1, use Taylor's series method to determine the value of y(0.2) and y(0.4).
8.	Given the differential equation $y'' = x^2 - xy$ and y(0) = 1, y'(0)=0, use Taylor's series method to determine the value of y(0.2).
9.	Given the differential equation $y'' = -xy$ and y(0) = 1, y'(0)=1use Taylor's series method to determine the value of y(0.2) and y(0.4).
10.	Given the differential equation $y' = x - y^2$ and y(0) = 1, use Taylor's series method to determine the value of y(0.1).
11.	Given the differential equation $y' = \frac{x^2}{y^2+1}$ and y(0) = 0, use Picard's method to determine the value of y(1).
12.	Given the differential equation $y' = x + y^2 + 1$ and y(0) = 0, use Picard's method to determine the value of y(0.1) and y(0.2).
13.	Given the differential equation $y' = \frac{y-x}{y+x}$ and y(0) = 1, use Picard's method to determine the value of y(0.1).
14.	Given the differential equation $y' = 1 + 2yx$ and y(0) = 0, use Picard's method to determine the value of y(0.5).
15.	Given the differential equation $y' = 1 + xy$ and y(0) = 1, use Picard's method to determine the value of y(0.3).
16.	Given the differential equation $y' = x - y^2$ and y(0) = 1, use Picard's method to determine the value of y(2).
17.	Given the differential equation $y' = x^2 + y^2$ and y(0) = 0, use Picard's method to determine the value of y(1.0).
18.	Given the differential equation $y' = 2x - y$ and y(1) = 3, use Picard's method to determine the value of y(1).
19.	Given the differential equation $y' = 1 + y^2$ and y(0) = 0, use Picard's method to determine the value of y(0.2) and y(0.4).
20.	Given the differential equation $y' = \frac{x^2}{1+y^2}$ and y(0) = 0, use Picard's method to determine the value of y(0.25) and y (0.5).
21.	Given the differential equation $y' = x^2 + y$ and y(0) = 1, use Euler's method to determine the value of y(0.2).
22.	Given the differential equation $y' = y - \frac{2x}{y}$ and y(0) = 1, use Euler's method to determine the value of y(0.3) by taking h=0.1.
23.	Given the differential equation $y' = x + y$ and y(0) = 0, use Euler's method to determine the value of y(0.6), y(0.8) and y(1) by taking h = 0.2.
24.	Given the differential equation $y' = xy$ and y(0) = 1, use Euler's method to determine the value of y(0.4).
25.	Given the differential equation $y' = \frac{y-x}{y+x}$ and y(0) = 1, use Euler's method to determine the value of y(0.1)

26.	Given the differential equation $y' = \log(x+y)$ and y(0) = 1, use Euler's method to determine the value of y(0.2) by taking h = 0.2.
27.	Given the differential equation $y' = y - x^2$ and y(0) = 1, use Euler's method to determine the value of y(0.2), y(0.4) and y(0.6).
28.	Given the differential equation $y' = x + \lvert\sqrt{y}\rvert$ and y(0) = 1, use Euler's method to determine the value of y(0.2) and y(0.4).
29.	Given the differential equation $y' = y - 1$ and y(0) = 1.1, use Euler's method to determine the value of y(1.5) by taking h=0.5.
30.	Given the differential equation $y' = y + sinx$ and y(0) = 2, use Euler's method to determine the value of y(0.5) by taking h = 0.1.
31.	Given the differential equation $y' = x + y$ and y(0) = 1, use fourth order Runge-Kutta method to determine the value of y(0.2).
32.	Given the differential equation $y' = y - x$ and y(0) = 2, use fourth order Runge-Kutta method to determine the value of y(0.2) taking h=0.1.
33.	Given the differential equation $y' = x + x^2y$ and y(0) = 1, use Second order Runge-Kutta method to determine the value of y(0.2) taking h = 0.1.
34.	Given the differential equation $y' = xy$ and y(1) = 2, use Third order Runge-Kutta method to determine the value of y(1.4) taking h = 0.2.
35.	Given the differential equation $y' = \frac{1}{2}(1+x)y^2$ and y(0) = 1, use fourth order Runge-Kutta method to determine the value of y(0.1) and y(0.2)..
36.	Given the differential equation $y' = \frac{1}{x^2} - \frac{y}{x}$ and y(1) = 1, use fourth order Runge-Kutta method to determine the value of y(1.1) taking h = 0.05.
37.	Given the differential equation $y' = \frac{1}{x+y}$ and y(0) = 1, use fourth order Runge-Kutta method to determine the value of y(0.5), y(1) and y(2) for h=0.5.
38.	Given the differential equation $y' = 1 + y^2$ and y(0) = 0, use Second order Runge-Kutta method to determine the value of y(0.2)and y(0.6).
39.	Given the differential equation $y' = -xy$ and y(0) = 1, use Third order Runge-Kutta method to determine the value of y(0.2) taking h = 0.2.
40.	Given the differential equation $y' = x - 2y$ and y(0) = 1, use fourth order Runge-Kutta method to determine the value of y(0.1) and y(0.2) taking h =0.1.
41.	Using Adams-Moulton method find y(2) given $y' = \frac{1}{2}(x+y)$ and y(0)=2, y(0.5)=2.363, y(1)=3.595 and y(1.5)=4.968.
42.	Using Adams-Moulton method find y(1.4) given $y' = \frac{1}{x^2} - \frac{y}{x}$ and y(1)=1, y(1.1)=0.996, y(1.2)=0.986 and y(1.3)=0.972.
43.	Using Adams-Moulton method find y(0.4) given $y' = y - \frac{2x}{y}$ and y(0)=1, y(0.1)=1.0959, y(0.2)=1.1841 and y(0.3)=1.2662.
44.	Using Adams-Moulton method find y(0.3) given $y' = x^2 - y$and y(0)=2, y(0.2)=0.2027, y(0.4)=0.4228 and y(0.6)=0.6841.
45.	Using Adams-Moulton method find y(0.8) given $y' = y - x^2$ and y(0)=1, y(0.2)=1.1218, y(0.4)=1.4682 and y(0.6)=1.7379.
46.	Using Adams-Moulton method find y(0.8) given $y' = \frac{1}{x+y}$, y(0)=2, y(0.2)=2.0933, y(0.4)=2.1755 and y(0.6)=2.2493.
47.	Using Milne's method find y(0.8) given $y' = y - x^2$ and y(0)=1, y(0.2)=1.12186, y(0.4)=1.46820 and y(0.6)=1.73790.

48.	Using Milne's method find y(0.4) and y(0.5) given $y' = 2e^x - y$ and y(0)=2, y(0.1)=2.010, y(0.2)=2.040 and y(0.3)=2.090.
49.	Using Milne's method find y(0.4) given $y' = x^2 + y^2 - 2$ and y(0)=1, y(0.1)=1.453, y(0.2)=1.6432 and y(0.3)=1.9835.
50.	Using Milne's method find y(1.4) given $y' = x^2(1 + y)$ and y(1)=1, y(1.1)=2.314, y(1.2)=2.146 and y(1.3)=2.346.
Unit-4	**Numerical solution of Ordinary Differential Equation-Boundary Value Problem**
[A]	**5 – Marks Questions**
1.	Compute y(0.5) from the boundary value problem $y'' - 64y + 10 = 0$ given y(0)=y(1)=0 by finite difference method.
2.	Solve the following boundary value problem $y'' = 6x$ given y(1)= 2, y(2)=9 by finite difference method.
3.	Compute y(1) from the boundary value problem $y'' = 6x + 4$ given y(0)=2, y(2) = 17, by finite difference method.
4.	Compute y(0.5) from the boundary value problem $y'' = 12x^2$ given y(1)=2, y(2)=17 by finite difference method.
5.	Compute y(0.5) from the boundary value problem $y'' = 3x + 4y$ given y(0)=1, y(1)=1 by finite difference method.
6.	Compute y(0.5) from the boundary value problem $y'' - 3y' + 2y = 2$ given y(0)=1, y(1)=4 by finite difference method.
7.	Compute y(0.5) from the boundary value problem $y'' - xy' + y = -x^2$ given y(0)=-2, y(1)=1 by finite difference method.
8.	Solve the boundary value problem $y'' = 3x + 4$ given y(0)=2, y(2)=5 by finite difference method.
9.	Solve the boundary value problem $y'' = x + y - 2$ given y(0)=2, y(1)=1 by finite difference method.
10.	Using cubic spline method solve the boundary value problem $y'' + y + 1 = 0$ given y(0)=0 and y(1)=0.
11.	Using cubic spline method solve the boundary value problem $y'' - y = 0$ given y(0)=0 and y(1)=1.
12.	Using cubic spline method solve the boundary value problem $y'' + 2y' + y = 30x$ given y(0)=0 and y(1)=0.
13.	Solve the boundary value problem $y'' = 3x + 4y$ given y(0)=1, y(1)=1 by cubic spline method.
14.	Using cubic spline method solve the boundary value problem $y'' - y = 0$ given y(0)=0 and y(1)=1.
15.	Compute y(1) from the boundary value problem $y'' = 6x + 4$ given y(0)=2, y(2) = 17, by shooting method.
16.	Compute y(0.5) from the boundary value problem $y'' - 64y + 10 = 0$ given y(0)=y(1)=0 by cubic spline method.
17.	Compute y(0.5) from the boundary value problem $y'' = 3x + 4y$ given y(0)=1, y(1)=1 by shooting method.
18.	Compute y(0.5) from the boundary value problem $y'' - xy' + y = -x^2$ given y(0)=-2, y(1)=1 by cubic spline method.
19.	Using cubic spline method solve the boundary value problem $x^2y'' - xy' - y = 0$ given y(1)=1 and y(2)=0.5 determine y(1.5).
20.	Solve the boundary value problem $y'' = e^{-2y}$ given y(1)=0 and y(2)=1 by using shooting method.

21.	Compute y(0.5) from the boundary value problem $y'' - 3y' + 2y = 2$ given y(0)=1, y(1)=4 by shooting method.
22.	Solve the boundary value problem $y'' = x + y - 2$ given y(0)=2, y(1)=1 shooting method.
23.	Solve the following boundary value problem $y'' = 6x$ given y(1)= 2, y(2)=9 by shooting method.
24.	Compute y(0.5) from the boundary value problem $y'' = 12x^2$ given y(1)=2, y(2)=17 by shooting method.
25.	Solve the boundary value problem $y'' = 6y^2$ given y(1)=1 and y(2)=0.25 by using shooting method.
26.	Solve the boundary value problem $y'' = y(x)$ given y(0)=0 and y(1)=1.1752 by using shooting method.