Unit – 1 (NUMERICAL METHODS-1)

Q.No	Questions
1.	(a) Obtain $y(0.2)$ using Picard's method upto second iteration for the initial value problem $\frac{dy}{dx} = x^2 - 2y\ , y(0) = 1$. (b) Solve $y' = x + y$,y(0)=1 by Picard's method up to second approximation,Hence find the value of y(1).compare with exact solution.
2.	(a) Solve $\frac{dy}{dx} = y - x^2$, y (0)=1 by Picard's method up to the third approximation. Hence find the value of y (0.1) and y(0.2). (b) Obtain a solution up to the third approximation of y for x=0.2 by Picard's method, given that $\frac{dy}{dx} = x + y + xy\ ; y(0) = 1$.
3.	(a) Solve $\frac{dy}{dx} = x^2+y^2$, y(0)=0 by Picard's method up to the second approximation. Hence find the value of y(0.1) (b) Solve $\frac{dy}{dx} = \frac{x^2}{y^2+1}$, y(0)=0 by Picard's method up to the second approximation. Hence find the value of y (0.25), y(0.5),y(1.0).
4.	(a)Obtain a solution upto the third approximation of y for x=0.2 by Picard's method, given that $\frac{dy}{dx} + y = e^x\ ; y(0) = 1$. (b) $\frac{dy}{dx} = 1 + y^2$;y(0)=0 ,compute y(0.8) correct to 4 decimal places by generating the initial values from Picard's second approximation.
5.	(a)Using Taylor's series method, find y at $x = 0.1$ and $x = 0.2$ considering up to 4th degree terms. Given that $\frac{dy}{dx} = x^2y - 1$ *and* $y(0) = 1$ (b) Given the differential equation $\frac{dy}{dx} = \frac{1}{x^2 + y}$,with y(4)=4 , obtain y(4.1) and y(4.2) by Taylor's series method
6.	(a) Solve $\frac{dy}{dx} = 2y + 3e^x$, y(0)=0. Using Taylor's series method find y(0.1),y(0.2) (b) Using Taylor's series method, find y at $x = 1.1$ and $x = 1.2$, Given that $\frac{dy}{dx} = x\, y^{1/3}$ *and* $y(1) = 1$
7.	(a)Employ Taylor's series method to find the approximate solution to find y at x=0.1 given $\frac{dy}{dx} = x - y^2$, y(0)=1 by considering upto 4th degree term. (b) Use Taylor's series method to obtain a power series in (x – 4) for the equation $5x\frac{dy}{dx} + y^2 - 2 = 0, x = 4, y = 1$ and use it to find y at x = 4.1 ,4.2
8.	(a)Solve the initial value problem y' = $-2xy^2$, y(0) = 1 for y at x = 1 using Taylor series method of order four. (b) Find y at x=1.4 correct four decimal places given dy =(xy-1)dx and y = 2 at x =1 by Applying Taylor's series method.
9.	(a)Solve by Euler's modified method to obtain $y(1.2)$ given $\frac{dy}{dx} = \frac{y+x}{y-x}$, $y(1) = 2$. (b) Solve $y' = \log_e(x + y)$, y(0)=2 ,h=0.2 by using modified Euler's method at the points x=0.2.
10.	(a)Solve the differential equation $\frac{dy}{dx} = -xy^2$ under the initial condition y(0)=2, by using modified Euler's method, at the points x=0.1 and x=0.2 .Take a step size of h=0.1 carry out two modifications at each step. (b) Solve by Euler's modified method to obtain $y(0.4)$ given $\frac{dy}{dx} = x + \lvert\sqrt{y}\rvert, y(0) = 1, h = 0.4$.
11.	(a) Given $\frac{dy}{dx} + y - x^2 = 0,\ y(0) = 0$.Find correct to four decimal places y(0.2) using modified Euler's method. (b) Using Euler's predictor and corrector formula compute y(1.1) correct to five decimal places given that $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$ and y=1 at x=1 .also find the analytical solution.

12. (a) Solve y′ =x + y ,given y(0)=1 , by using modified Euler's method step length is h=0.1.

(b) Using modified Euler's method find y at x=0.2 given $\frac{dy}{dx} = 3x + \frac{y}{2}$ with y(0)=1 taking h=0.1. Perform two iterations at each step.

13. (a) Solve $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ $with\ y(0) = 1$, find y at x=0.2 using Runge-kutta method of 4th order taking step- length h=0.2. Accurate up to 4th decimal places.

(b) Integrate differential equation by Runge Kutta method of fourth order given $y' = -2xy^2$, y(0)=1, h=0.2 ,find y(0.2).

14. (a) Apply Runge-kutta method to find an approximate value of y for x=0.2 in step of 0.2 of $\frac{dy}{dx} = x + y^2$, given that y=1 when x=0.

(b)Use the Runge kutta fourth order method to find the value of y when x=0.3 given that y=1 when x=0 and that $\frac{dy}{dx} = \frac{y-x}{y+x}$

15. (a) Apply Runge-kutta method to find an approximate value of y for x=0.2 in step of 0.2 for $\frac{dy}{dx} = x + y$, given that y=1 when x=0.

(b) Apply Runge-kutta method to find an approximate value in the range $0 \leq x \leq 0.1$ by taking h=0.1 for $\frac{dy}{dx} = x(1 + xy)$, given that y=1 when x=0

16. (a) Apply Runge-kutta method of 4th order, to compute y(0.3).Given that $10\frac{dy}{dx} = x^2 + y^2$ y(0)=1,taking h=0.3.

(b) Using Runge kutta method of fourth order find y(20.2) for the equation $\frac{dy}{dx} = log_{10}\left(\frac{x}{y}\right)$, y(20)=5 taking h=0.2.

17. (a)Given that that $\frac{dy}{dx} = x^2(1 + y)$ and y(1)=1; y(1.1)=1.233 ; y(1.2)=1.548; y(1.3)=1.979,find y at x=1.4 by using Milne's predictor and corrector method.

(b)Use Taylor's series method to obtain the solution as a power series in x (up to third derivative terms) given that $\frac{dy}{dx} - y^2 = x, y(0) = 0$. using this generate the values of y corresponding to x = 0.2, 0.4, 0.6 correct to four decimal places. Then apply Milne's predictor corrector formulae to Compute y at x = 0.8.

18. (a) The following table gives the solution of $\frac{dy}{dx} = x - y^2$. Find the value of y at x=0.8 using Milne's predictor and corrector formulae.

x	0	0.2	0.4	0.6
y	0	0.02	0.07	0.17

(b) If $\frac{dy}{dx} = x + y^2$;y(0)=1, y(0.1)=1.1, y(0.2)=1.231, y(0.3)=1.402,compute y(0.4) correct to three decimal places, using the Milne's predictor –corrector method. Apply the corrector formulae twice.

19. (a) If $\frac{dy}{dx} = xy + y^2; y(0) = 1, y(0.1) = 1.1169, y(0.2) = 1.2773, y(0.3) = 1.5049$ find y(0.4) correct to three decimal places, using the Milne's predictor –corrector method. Apply the corrector formulae twice.

(b) Given $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$ and the data

x	1	1.1	1.2	1.3
y	1	0.996	0.986	0.972

Compute y(1.4) correct to 3 decimal places by applying Milne's method.

20. (a) Using Milne's formulae, Determine y(0.4) given the differential equation for $\frac{dy}{dx} = \frac{1}{2}xy$ and the data, y(0)=1, y(0.1)=1.0025, y(0.2)=1.0101, y(0.3)=1.0228. Apply the corrector formulae twice.

(b) Using Milne's method find y(1.4) given that $\frac{dy}{dx} = x^2 + \frac{y}{2}$ with y(1)=2. Obtain the initial values of y at X=1.1, 1.2, 1.3 by Taylor's series method of order 4.