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QUESTION BANK

NUMERICAL METHODS-2

Taylor's Series Method

1. Employ Taylor's series method to find an approximate solution to find y at x = 0.1 given $\frac{dy}{dx} = x - y^2$, y(0) = 1 by considering upto fourth degree term.
2. Employ Taylor's series method to obtain the value of y at x = 0.1 and 0.2 for the differential equation $\frac{dy}{dx} = 2y + 3e^x$, y(0) = 0 considering upto fourth degree term.
3. Using the Taylor's series method, find the third order approximate solution at x = 0.4 of the problem $\frac{dy}{dx} = x^2 y + 1$, with y(0) = 0. Consider terms upto fourth degree.
4. Using the Taylor's series method, solve the initial value problem $\frac{dy}{dx} = x^2 y - 1$, y(0) = 1 at the point x = 0.1and x = 0.2 Considering upto fourth degree term.
5. Given that $\frac{dy}{dx} = x^2 + y^2$ and y(0) = 1, to find an approximate value of y at x = 0.1 and x = 0.2 by Taylor's series method.
6. Find y(0.1) correct to 6 decimal places by Taylor's series method when $\frac{dy}{dx} = xy + 1$, y(0) = 1.0 consider upto fourth degree term.
7. Find y at x = 1.02 correct to five decimal places given $dy = (xy - 1)dx$ and y = 2 at x = 1 applying Taylor's series Method.
8. Given that $\frac{dy}{dx} = x + y$ and y(1) = 0, to find an approximate value of y at x = 1.1 and x = 1.2 by Taylor's series method.
9. Using the Taylor's series method, solve $y' = x^2 + y$ given that y = 10 at x = 0 initially considering the terms upto the fourth degree.
10. Employ Taylor's series method to find y(4.1) and y(4.2) given $\frac{dy}{dx} = \frac{1}{x^2 + y}$, y(4) = 4 by considering upto third degree term.

Modified Euler's Method

11. Solve the following by Euler's modified method $\frac{dy}{dx} = log(x + y)$, y (1) = 2 to find y (0.2) by taking h = 0.2.Carry out two modifications.
12. Determine the value of y when x = 0.1, given that y(0)= 1 and $y' = x^2 + y^2$ using Modified Euler's formula. Take h = 0.1.

13. Use Modified Euler's method to solve $\frac{dy}{dx} = y + e^x$, y(0) = 0 find y(0.2) taking h=0.2 .

14. Solve the differential equation $\frac{dy}{dx} = -xy^2$ under the initial condition y(0) = 2, by using the modified Euler's Method, at the points x = 0.1 take the step size h = 0.1.

15. Using Euler's modified method solve for y at x = 0.1, h=0.1 and $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ carry out three modifications.

16. Given $\frac{dy}{dx} + y - x^2 = 0$, $y(0) = 1$ find y(0.1) take h=0.1 using modified Euler's Method.

17. Given $\frac{dy}{dx} = 1 + \frac{y}{x}$, $y = 2$ *at* $x = 1$ find the approximate value of y at x = 1.2 by taking step size h = 0.2 applying modified Euler's method.

18. Use Modified Euler's method find y at x = 0.1 given $\frac{dy}{dx} = 3x + \frac{y}{2}$, $y(0) = 1$ *taking* $h = 0.1$ perform three iterations.

19. Use Modified Euler's method to solve $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$, y(20) = 5 taking h = 0.2 find y(20.2).

20. Using Modified Euler's method compute y(1.1) taking h=0.1 given that $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$, $y(1) = 1$.

Runge – Kutta method of fourth order

21. Employ Runge – Kutta method to solve $\frac{dy}{dx} = 3x + \frac{y}{2}$, $y(0) = 1$ find y at x = 0.2 by taking h=0.2.

22. Apply Runge – Kutta method of order 4, to find an approximate value of y for x = 0.1 in steps of 0.1, if $\frac{dy}{dx} = x + y^2$ given that y = 1when x = 0.

23. Solve $\frac{dy}{dx} = x + y$, $y(0) = 1$ find y at x=0.2 using Runge – Kutta method. Take h = 0.2.

24. Employ Runge – Kutta method to solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$ find y at x = 0.2 by taking h=0.2.

25. Using fourth order Runge – Kutta method find y(0.2) for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ taking h = 0.2.

26. Using fourth order Runge – Kutta method compute y (1.1), h=0.1 given that $\frac{dy}{dx} = xy^{\frac{1}{3}}, y(1) = 1$.

27. Using fourth order Runge – Kutta method find y at x = 0.1 given that $\frac{dy}{dx} = 3e^x + 2y, y(0) = 0$ and h = 0.1.

28. Using fourth order Runge – Kutta method, compute y(0.2) for $y' = y - \frac{2x}{y}$, $y(0) = 1$, take h = 0.2.

29. Employ Runge – Kutta method to solve $\frac{dy}{dx} = 3e^x + 2y,\ y(0) = 0$ find y at x = 0.1 by taking h=0.1.

Predictor and Corrector methods

30. Find $y(1.4)$ by using Milne's Predictor and Corrector method, given $\frac{dy}{dx} = x^2 + \frac{y}{2}$

X	1	1.1	1.2	1.3
Y	2	2.2156	2.4649	2.7514

31. Given $\frac{dy}{dx} = xy + y^2$, $y(0) = 1,\ y(0.1) = 1.1169, y(0.2) = 1.2773, y(0.3) = 1.5049$, find y (0.4) using the Milne's predictor – corrector method. Apply the corrector formula twice.

32. Apply Milne's method to compute y (1.4) correct to four decimal places $\frac{dy}{dx} = x^2 + \frac{y}{2}$ and the following data: $y(1) = 2,\ y(1.1) = 2.2156,\ y(1.2) = 2.4649\ y(1.3) = 2.7514$.

33. The following table gives the solution of $5xy' + y^2 - 2 = 0$. Find the value of x = 4.5 using Milne's and Milne's method predictor and corrector formulae. Use the corrector formula twice

x	4	4.1	4.2	4.3	4.4
y	1	1.0049	1.0097	1.0143	1.0187

34. If $\frac{dy}{dx} = 2e^x - y,\ y(0) = 2,\ y(0.1) = 2.010,\ y(0.2) = 2.040,\ y(0.3) = 2.090$, find y (0.4) correct to four decimal places by using Milne's method.