Assignment Questions

1) Given $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + 2xy = 1$, $y(0) = 1$, and $y'(0) = 1$. Evaluate $y(0.1) = ?$ using R.K. Method. (3)

2) Compute $y(0.1)$, given $\frac{d^2y}{dx^2} = y^8$ and $y(1) = 10$, $\frac{dy}{dx} = 5$ at $x = 0$.

3) Solve, $y'' + 4y = xy$. given that $y(0) = 3$, $y'(0) = 0$. Compute $y(0.1) = ?$, by RK method.

4) Solve, $\frac{dy}{dx} = x - y^2$, and the data $y(0) = 0$, $y(0.2) = 0.02$, $y(0.4) = 0.0795$ & $y(0.6) = 0.1762$ Compute $y(0.8) = ?$. (3)

5) By applying Milne's method

Using milne's method, Compute $y(0.8) = ?$, $\frac{d^2y}{dx^2} = 1 - 2y\cdot\frac{dy}{dx}$ from the following data. (3)

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

Apply the corrector formulae twice.

6) Derive Euler's Equation. with diagram (fixed question) (3)

7) Prove that the geodisic on a plane are Straight Line.

Assignment Questions

8) Prove that the catenary is the curve when rotated above the line generates a surface of minimum area.

9) Find the geodisic on the surface given that the arc length on the surface is

$$S = \int_{x_1}^{x_2} \sqrt{x(1+y'^2)}\, dx$$

10) Find the extremum of $\int_{x_1}^{x_2} (y^2 + y'^2 + 2ye^x)\, dx$

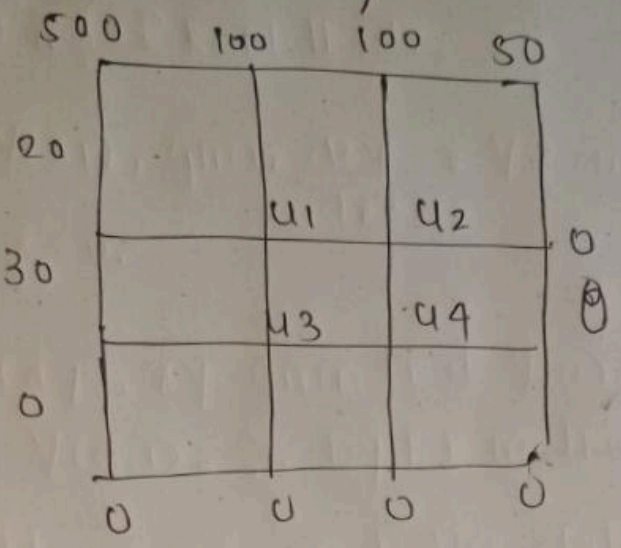
11) Derive one dimensional heat Equation

12) Derive one dimensional Wave Equation

13) Solve $\frac{\partial^2 u}{\partial t^2} = 4.\frac{\partial^2 u}{\partial x^2}$ subject to $u(0,t) = u(4,t) = 0$ $u_t(x,0) = 0$ & $u(x,0) = x(4-x)$ by taking Step length in x, $h = 1$.

14) Solve $U_t = U_{xx}$, subject to the conditions $u(0,t) = 0$, $u(1,t) = 0$, $u(x,0) = \sin \pi x$, $0 \le t \le 0.1$ by taking $h = 0.2$ & by applying Bendre Schmidt Explicit formula & hence find (i) $u(0.2, 0.04)$ & (ii) $u(0.6, 0.06)$

15) Solve $U_{xx} + U_{yy} = 0$ in the following square region with the boundary conditions as indicated in the fig



16) Solve the elliptic Equation $U_{xx} + U_{yy} = 0$ for the following square mesh with boundary values as shown in figure. Use Liebmann's method for 2nd & 3rd iteration