UNIT 5NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION
FOURTH ORDER RUNGE KUTTA METHOD FOR SOLVING 1ST ORDER EQUATIONS

Fourth order Runge-Kutta method for solving first and second order equations

Second order R-K Method

$K_1 = hF(x, y)$

$K_2 = hF\left(x + \frac{h}{2}, y + \frac{K_1}{2}\right)$

$\Delta y = K_2$ where $h = \Delta x$; $y_1 = y_0 + \Delta y$

Third order RK Method:

$K_1 = hF(x, y)$

$K_2 = hF\left(x + \frac{h}{2}, y + \frac{K_1}{2}\right)$

$K_3 = hF(x + h, y + 2K_2 - K_1)$

$\Delta y = \frac{1}{6}[K_1 + 4K_2 + K_3]$

Now $y_1 = y_0 + \Delta y$

Fourth order RK Method:

$K_1 = hF(x, y)$

$K_2 = hF\left(x + \frac{h}{2}, y + \frac{K_2}{2}\right)$

$K_3 = hF\left(x + \frac{h}{2}, y + \frac{K_2}{2}\right)$

$K_4 = hF[x + h, y + K_3]$

$\Delta y = \frac{1}{6}[K_1 + 2K_2 + 2K_3 + K_4]$

$y_1 = y_0 + \Delta y$