Step - 1

GVF Profile

$$\frac{dy}{dx} = f(x) = \frac{S_0 - S_f}{1 - F_r^2} \qquad \text{where } F_r = \frac{Q}{A\sqrt{gy}}$$

$$S_f = \frac{Q^2 n^2}{A^2 R^{2/3}} = \frac{Q^2 n^2 p^{4/3}}{A^{10/3}}$$

Using RK - 2 method

$$k_1 = h * f(x_n, y_n)$$

$$k_2 = h * f(x_n + h, y_n + k_1)$$

$$y_{n+1} = y_n + \frac{1}{2}(k_1 + k_2)$$

where $h = \frac{\text{Length}}{n\,\text{Divs}} = \frac{18000}{18000} = 1$ ...in our calculations

(n Divs ↑ no. of divisions)

∴ we get the depth data

Also, $A_{rea} = y(2y + 40)$

$$\therefore \quad V = \frac{Q}{A} = \frac{Q}{y(2y+40)} = \frac{10}{y(2y+40)}$$

Step 2 Pollutant Conc. using TDMA

Here, we invert the coordinates axes, i.e. we take 1.8 km upstream as the initial "0"th point.

@ $x=0$ $\quad C_0 = 0.01 \times 1000 \ \frac{kg}{m^3(sec)}$ Assuming source is polluting @ $0.01 \ \frac{mg}{L \ sec.}$

@ intermediate point.

$$C_{i-1}\left[\frac{E}{\Delta x^2} - \frac{U}{2\Delta x}\right] + C_{i+1}\left[\frac{E}{\Delta x^2} - \frac{U}{2\Delta x}\right] - C_i\left[\frac{2E}{\Delta x^2} + k\right] + S = 0$$

@ weir dam

i.e. steady state condition assumption

$$\frac{C_n - C_{n-1}}{\Delta x} = 0$$