

## **SNS COLLEGE OF ENGINEERING**

Kurumbapalayam (Po), Coimbatore – 641 107



#### AN AUTONOMOUS INSTITUTION

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

### Topic: 5.2- Taylor's series method

8. Given 
$$\frac{dy}{dx} = x - y^2$$
,  $y(0) = 1$ ,  $y(0 - 1) = 0.9052$ ,  $y(0 - 2) = 0.8213$ , find (0)  
 $y(0 - 3)$  using Taytor's method. (NOVIDEC 2013).  
Sola: Here  $x_4 = 0$ ,  $x_1 = 0 - 1$ ,  $x_4 = 0 - 2$ ,  $x_3 = 0.3$   
 $y_0 = 1$ ,  $y_1 = 0.9052$ ,  $y_2 = 0.8213$ ,  $h = 0 - 1$ .  
To find  $y(0 - 3)$ .  
Here  $x_4 = 0.2$ ,  $y_2 = 0.8213$ .  
Taytor's Series is  
 $y_3 = y(0 - 3) = y_2 + \frac{h}{1!} y_2' + \frac{h^2}{2!} y_3'' + \frac{h^3}{3!} y_3''' + \dots$   
 $y'' = x - y^2$   
 $y'' = 1 - 2y'y'$   
 $y''' = -2 [yy'' + y'^2]$   
 $y''' = -2 [yy'' + y'^2]$   
 $y''' = -2 [yy'' + y'^2]$   
 $y''' = 0.8213 + (0 - 1) (-0.47) + \frac{(0 - 1)^3}{2!} (1 - 77) + \frac{(0 - 1)^3}{3!} (-3.35)$   
 $= 0.8213 - 0.047 + 0.01 - 0.0006$ 



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$$\begin{split} \underbrace{\Psi(o, \theta) = (.bb \, 92}_{0} \\ \text{b. Using Taylor's method, find } \Psi(o, 1), \Psi(o, 2) \text{ and } \Psi(o, 3) \notin \\ \\ \frac{dy}{dx} = \chi - \Psi^{2}, \Psi(o) = 1. \qquad [Nov(Dec'(12))] \\ \text{Soln:} \\ \text{Given } \chi_{e} = 0, \quad \chi_{e} = 0, 1, \quad \chi_{2} = 0, 2, \quad \chi_{3} = 0, 3, \\ \\ \Psi_{0} = 1, \quad h = 0, 1. \\ \text{To find } \Psi(o, 1) \\ \text{Taylor's Series expansion is} \\ \\ \Psi_{1} = \Psi_{0} + \frac{h}{1!}, \Psi_{1}^{i} + \frac{h^{2}}{2!}, \Psi_{0}^{ii} + \frac{h^{3}}{3!}, \Psi_{0}^{iii} + \frac{h^{4}}{4!}, \Psi_{0}^{iii} + \cdots \\ \\ \Psi_{1}^{i} = \chi_{0} + \frac{h}{1!}, \Psi_{0}^{i} + \frac{h^{2}}{2!}, \Psi_{0}^{iii} = 1, 249, \Psi_{0}^{iii} = 3, \\ \\ \Psi_{1}^{iii} = 1, 249, \Psi_{0}^{iii} = 1, 249, \Psi_{0}^{iii} = 2, 2[\Psi,\Psi_{0}^{iii},\Psi_{0}^{iiii}] = -8 \\ \\ \Psi_{0}^{iiii} = \Psi_{0}(0,1) = 1 + \frac{(0,1)^{(a)}}{1!} + \frac{(0,1)^{2}}{2!} (3) + \frac{(0,1)^{3}}{3!} (-8) + \cdots \\ \end{split}$$