

$$[S = x^2]$$

Normal form is given by -

$$\frac{d^2v}{dx^2} + IV = \frac{S}{e} \quad \text{--- (I)}$$

On putting the value of  $I$  &  $S$  in eqn (I)

$$\Rightarrow \frac{d^2v}{dx^2} - 9v = x^2$$

$$\Rightarrow (\partial^2 - 9)v = x^2$$

Now the A.E. is -

$$m^2 - 9 = 0$$

$$m^2 = 9$$

$$[m = \pm 3]$$

$$\text{So, [C.F.} = C_1 e^{3x} + C_2 e^{-3x}]$$

$$\Rightarrow \text{P.I.} = \frac{1}{\partial^2 - 9} (x^2) = \frac{1}{-9(1 - \frac{\partial^2}{9})} (x^2)$$

$$\Rightarrow \text{P.I.} = \frac{-1}{9} \left[ 1 - \frac{\partial^2}{9} \right]^{-1} (x^2) = \frac{-1}{9} \left[ 1 + \frac{\partial^2}{9} \right] (x^2)$$

$$\Rightarrow \text{P.I.} = \frac{-1}{9} \left[ x^2 + \frac{2}{9} \right]$$

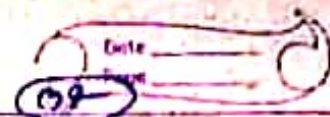
So, Complete Solution,  $u = \text{C.F.} + \text{P.I.}$

$$\Rightarrow u = C_1 e^{3x} + C_2 e^{-3x} - \frac{1}{9} \left( x^2 + \frac{2}{9} \right)$$

Thus,  $y = u \times v$

$$y = \left[ C_1 e^{3x} + C_2 e^{-3x} - \frac{1}{9} \left( x^2 + \frac{2}{9} \right) \right] e^{-x/2}$$

## SECTION-09

Question answer No-02Given as-

$$\frac{d^2y}{dx^2} + 2x \frac{dy}{dx} + (x^2 - 0)y = x^2 e^{-0.5x^2} \quad \text{--- (1)}$$

On comparing with equation -

$$\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = R$$

We have,

$$P = 2x \quad Q = x^2 - 0$$

$$R = x^2 e^{-0.5x^2} = x^2 e^{-\frac{x^2}{2}}$$

$$\Rightarrow u = e^{-\int P dx} = e^{-\int 2x dx} = e^{-x^2}$$

$$u = e^{-x^2}$$

Let  $y = uv$  be the complete solution -

$$I = Q - \frac{1}{2} \frac{d(P)}{dx} - \frac{P^2}{4}$$

$$I = x^2 - 0 - \frac{1}{2} \frac{d(2x)}{dx} - \frac{(2x)^2}{4}$$

$$I = x^2 - 0 - \frac{1}{2}(2) - \frac{4x^2}{4}$$

$$I = x^2 - 0 - x^2 - 1$$

$$I = -1$$

$$S = \frac{R}{u} = \frac{x^2 e^{-\frac{x^2}{2}}}{e^{-x^2}}$$