Section - 9

Ans - Q. $(D^2 - 3D + 2)\, y = x^2 + 2x + 1$.

Solution $\Rightarrow$ $(D^2 - 3D + 2)\, y = x^2 + 2x + 1$

Auxiliary equation.

$$m^2 - 3m + 2 = 0$$

$$(m-1)(m-2) = 0$$

$$m = 1, 2$$

$$P.I = \frac{1}{(D^2 - 3D + 2)} (x^2 - 2x + 1)$$

$$= \frac{1}{2}\left[1 + \frac{D^2 - 3D}{2}\right]^{-1} (x^2 - 2x + 1)$$

$$= \frac{1}{2}\left[1 - \frac{D^2}{2} + \frac{3D}{2} + \left(\frac{D^2 - 3D}{2}\right)^2 \ldots\right](x^2 + 2x + 1)$$

$$= \frac{1}{2}\left[1 + \frac{D^2}{2} + \frac{3D}{2} + \frac{9D^2}{4}\right](x^2 + 2x + 1)$$

Neglecting high terms

$$= \frac{1}{2}\left[x^2 + 2x + 1 - \frac{2}{2} + \frac{3}{2}(2x + 2) + \frac{9}{4} \times 2\right]$$

$$= \frac{1}{2}\left[x^2 + 2x + 3x + 3 + \frac{9}{2}\right]$$

$$= \frac{1}{2}\left[x^2 + 5x + \frac{15}{12}\right] \qquad Y = CF + PI$$

$$= c_1 e^x + c_2 e^{2x} + \frac{1}{2}\left[x^2 + 5x + \frac{15}{2}\right]$$