1. Solve $[D^2 - 4D + 1]y = \cos x \cos 2x + \sin^2 x$

Ans:- $y = e^{2x}[c_1 \cosh\sqrt{3}\,x + c_2 \sinh\sqrt{3}\,x]$

$+ \frac{1}{2} - \frac{1}{8}\sin x - \frac{1}{104}(3\sin 3x + 2\cos 3x)$

$+ \frac{1}{146}(8\sin 2x + 3\cos 2x)$

2. Solve $[D^2 - 3D + 2]y = x^2 + 2x + 1$

Ans:- $y = c_1 e^x + c_2 e^{2x} + \frac{1}{2}\left(x^2 + 5x + \frac{15}{2}\right)$

3. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = x^2 e^{-x}\cos x$

Ans:- $y = (c_1 + c_2 x)e^x + e^{-x}(-x^2\cos x + 4x\sin x + 6\cos x)$

4. Solve $[D^2 + 2D + 1]y = x\cos x$

Ans:- $y = (c_1 + c_2 x)e^{-x} + \frac{1}{2}\cos x + \frac{1}{2}(x - 1)\sin x$

5. Solve $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 12\frac{dy}{dx} + 8y = 0$

under the conditions $y(0) = 0$, $y'(0)$ and $y''(0) = 2$

Ans:- $y = x^2 e^{-2x}$.