1 $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 8$

$\therefore m^2 - m - 2 = 0$

$m^2 + m - 2m - 2$

$m(m+1) - 2(m+1)$

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

$m_1 = -1 \quad m_2 = 2$

$y = Ae^{-x} + Be^{2x}$

P.I: $y = c$

$\frac{dy}{dx} = 0$ & $\frac{d^2y}{dx^2} = 0$

$0 - 0 - 2(c) = 8$

$-2c = 8$

$c = 8/-2$

$c = -4$

$= y = Ae^{-x} + Be^{2x}$ //

2 $\frac{d^2y}{dx^2} - 4y = 10e^{3x}$

$m^2 - 4 = 0$

$m^2 - 2^2 = 0$

$m = \sqrt{2^2}$

$m = 2$

$y = [C\cosh 2x + D\sinh 2x]$

P.I $= y = Ce^{3x}$

$\frac{dy}{dx} = 3Ce^{3x}$

$\frac{d^2y}{dx^2} = 9Ce^{3x}$

$= 9Ce^{3x} - 4(Ce^{3x}) = 10e^{3x}$

$9c - 4c = 10$

$5c = 10$

$c = 2$

$y = C\cosh 2x + D\sinh 2x + 2e^{3x}$ //

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

$m^2 + 2m + 1 = 0$

$m^2 + m + m + 1$

$m(m+1) + 1(m+1)$

$m + 1 = 0$

$m = -1$

$y = e^{-x}(A + Bx)$

P.I $= y = Ce^{-2x}$

$\frac{dy}{dx} = -2Ce^{-2x}$ & $\frac{d^2y}{dx^2} = 4Ce^{2x}$

$4Ce^{2x} + 2C - 2(e^{-2x}) + Ce^{-2x} = e^{-2x}$

$4Ce^{2x} - 4Ce^{-2x} + Ce^{-2x} = e^{-2x}$

$4C - 4C + C = 1$

$C = 1$

$\therefore y = e^{-x}(A + Bx) + e^{-2x}$ //

4 $\frac{d^2y}{dx^2} + 25y = 5x^2 + x$

$m^2 + 5^2 = 0$

$m = \sqrt{5^2}$

$m = \pm 5j$

$y = (C\cos 5x + D\sin 5x)$

P.I $= y = Cx^2 + Dx + E$

$\frac{dy}{dx} = 2Cx + D$ & $\frac{d^2y}{dx^2} = 2C$

$\therefore 2C + 25Cx^2 + 25Dx + 25E = 5x^2 + x$

$\therefore 25C = 5$ — (1)

$2C + 25E = 0$ — (2)

$25D = 1$ — (3)

Solving simultaneously

$C = 1/5$

$D = 1/25$

Sub in equ (2)

$2(1/5) + 25E = 0$

$2/5 = +25f$

$f = 2/5 \div 25$

$f = -\frac{2}{125}$

$y = C\cos 5x + D\sin 5x + 2/5x^2 + 1/25x - 2/125$ //

6 $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 4\sin x$

$m^2 - 2m + 1 = 0$

$m^2 - m - m + 1$

$m(m-1) - 1(m-1)$

$m - 1 = 0$

$m = 1$

$y = e^x(A + Bx)$

P.I $= y = C\cos x + D\sin x$

$\frac{dy}{dx} = -C\sin x + D\cos x$

$\frac{d^2y}{dx^2} = -C\cos x - D\sin x$

$= -C\cos x - D\sin x - 2C\sin x - 2D\cos x + C\cos x + D\sin x = 4\sin x$

$\cos x(C \cdot C - 2D + C) + \sin x(-D - 2C + D) = 4\sin x$

$(-C - 2D + C) = 0$ — ①

$(-D - 2C + D) = 4$ — ②

$= -2D = 0$

$= D = 0$ //

$= 2C = 4$

$C = 4/2$

$C = 2$

$y = e^x(A + Bx) + 2\cos x$ //

6 $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 2e^{-2x}$

$m^2 + 4m + 5 = 0$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\frac{4 \pm \sqrt{4^2 - 4 \times 1 \times 5}}{2 \times 1}$

$$\frac{-4 \pm \sqrt{16-20}}{2}$$

$$\frac{-4 \pm \sqrt{-4}}{2}$$

$$\frac{-4 \pm 2j}{2}$$

$$-2 \pm j$$

$y = e^{-2x} A\cos x + B\sin x$

P.I $= y = Ce^{-2x}$

$\frac{dy}{dx} = -2Ce^{-2x}$

$\frac{d^2y}{dx^2} = 4Ce^{-2x}$

$4Ce^{-2x} - 8Ce^{-2x} + 5Ce^{-2x} = 2e^{-2x}$

$4C - 8C + 5C = 2$

$C = 2$

$\therefore y = e^{-2x} A\cos x + B\sin x + 2e^{-2x}$ //

7) $3\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - y = 2x - 3$

$3m^2 - 2m - 1 = 0$

$3m^2 - 3m + m - 1$

$3m(m-1) + 1(m-1)$

$3m - 1 = 0$ & $m + 1 = 0$

$m_1 = -1/3 \quad m_2 = 1$

$y = Ae^{-1/3x} + Be^{x}$

P.I $= y = Cx + D$

$\frac{dy}{dx} = C$ & $\frac{d^2y}{dx^2} = 0$

$0 - 2(C) - (Cx + D) = 2x - 3$

$-2C - (Cx + D) = 2x - 3$

$C = -2$

$-2C + D = -3$

$-2(-2) + D = -3$

$4 + D = -3$

$D = 7$

$\therefore y = Ae^{-1/3x} + Be^{x} - 2x + 7$ //

8) $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = 8e^{4x}$

$m^2 - 6m + 8 = 0$

$m^2 - 2m - 4m + 8$

$m(m-2) - 4(m-2)$

$(m-4)$ & $(m-2) = 0$

$m_1 = 2$ & $m_2 = 4$

$y = Ae^{2x} + Be^{4x}$

P.I $= y = Ce^{4x}$

$\frac{dy}{dx} = 4Cxe^{4x} + Ce^{4x}$

$\frac{d^2y}{dx^2} = 16Cxe^{4x} + 8Ce^{4x}$

$16Cxe^{4x} + 8Ce^{4x} - 24Cxe^{4x} - 6Ce^{4x} + 8Cxe^{4x} = 8e^{4x}$

$16Cx + 8C - 24Cx - 6C + 8Cx = 8$

$2C = 8$

$C = 8/2$

$C = 4$

$\therefore y = Ae^{2x} + Be^{4x} + 4xe^{4x}$ //