KAREEM JAMIU T.
15/ENG04/1033
ENG 381

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

$m^2 - m - 2 = 0$

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

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

$m_1 = -1 \quad m_2 = 2$

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

P.I. $= y = c$

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

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

$-2c = 8$

$c = +4$

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

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

$m^2 - 4 = 0$

$m^2 - 2^2 = 0$

$m = \sqrt{2^2}$

$m = \pm 2$

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

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

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

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

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

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

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

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

$9C - 4C = 10$

$5C = 10$

$C = 2$

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

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

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

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

$(m+1)(m+1) = 0$

$m = -1$

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

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

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

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

$4C - 4C + C = 1$

$C = 1$

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

4) $d^2y/dx^2 + 25y = 5x^2 + x$

$m^2 + 5^2 = 0$

$m = \pm 5j$

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

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

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

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

$25C = 5$ ---①

$2C + 25E = 0$ ---②

$25D = 1$ ---③

$C = 1/5 \quad D = 1/25$

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

$E = 2/5 \div 25$

$E = -2/125$

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

5) $d^2y/dx^2 - 2\,dy/dx + y = 4\sin x$

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

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

$m - 1 = 0$

$m = 1$

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

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

$dy/dx = -C\sin x + D\cos x$

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

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

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

$C(-C - 2D + C) = 0$ --①

$(-D - 2D + D) = 4$ --②

$= -2D = 0 \quad D = 0$

$2C = 4 \quad C = 2$

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

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

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

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

$= -2 + j$

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

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

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

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

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

$C = 2$

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

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

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

$3m(m-1) + 1(m-1) = 0$

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

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

$PI = y = Cx + D$

$dy/dx = C$ & $d^2y/dx^2 = 0$

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

$C = -2$

$-2C + D = -3$

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

$D = 7$

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

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

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

$m_1 = 2 \quad m_2 = 4$

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

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

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

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

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

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

$2C = 8$

$C = 4$

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