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15/ENG02/1017
COMPUTER ENGINEERING
ENG381 [ENGINEERING MATHEMATICS]

ASSIGNMENT

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

$m^2 - m - 2 = 0$

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

$\frac{1 \pm \sqrt{1+8}}{2}$

$m = \frac{1 \pm \sqrt{9}}{2}$

$m = \frac{1 \pm 3}{2}$

$m_1 = \frac{1+3}{2}$ or $m_2 = \frac{1-3}{2}$

$m_1 = 2$ or $m_2 = -1$

$\therefore C.F \Rightarrow y = Ae^{2x} + Be^{-x}$

Since $f(x) = 8 \therefore y = c$

$\frac{dy}{dx} = 1$

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

$0 - 1 - 2(c) = 8$

$-1 - 2c = 8$

$-2c = 9$

$c = -9/2$

$\therefore y = -9/c$

G.S = CF + PI

$\therefore y = Ae^{2x} + Be^{-x} - 9/2$

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

$m^2 - 4 = 0$

$m^2 = \pm 4$

$m = \pm\sqrt{4}$

$m = \pm 2$

$\therefore y = A\cosh 2x + B\sinh 2x \Rightarrow C.F$

Since $f(x) = 10e^{3x} \therefore y = ce^{3x}$

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

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

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

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

$5c = 10$

$c = \frac{10}{5}$

$c = 2$

$\therefore y = 2e^{3x} \Rightarrow PI$

G.S = CF + PI

$\therefore y = A\cosh 2x + B\sinh 2x + 2e^{3x}$

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

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

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

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

$m = \frac{-2 \pm \sqrt{0}}{2}$

$m = \frac{-2 \pm 0}{2}$

$m_1 = \frac{-2+0}{2}$ or $m_2 = \frac{-2-0}{2}$

$m_1 = -1$ or $m_2 = -1$

$\therefore y = e^{-x}(A + Bx) \Rightarrow C.F$

P.I

$f(x) = e^{-2x} \therefore y = Ce^{-2x}$

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

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

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

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

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

$C = 1$

$\therefore y = e^{-2x}$

$G.S = CF + PI$

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

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

$m^2 + 25 = 0$

$m^2 = \pm -25$

$m = \pm \sqrt{25}$

$m = \pm j\sqrt{25}$

$m = \pm j5$

$\therefore y = A\cos 5x + B\sin 5x \Rightarrow C.F$

P.I

$f(x) = 5x^2 + x \therefore y = (Cx^2 + Dx + E)$

$\frac{dy}{dx} = 2Cx + D$

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

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

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

$25C = 5$

$C = \frac{5}{25} = 1/5$

$25D = 1$

$D = 1/25$

$2C + 25E = 0$

$2/5 + 25E = 0$

$25E = -2/5$

$E = -2/125$

$\therefore y = 1/5x^2 + 1/25x - 2/125 \Rightarrow P.I$

$G.S = CF + PI$

$\therefore y = A\cos 5x + B\sin 5x + 1/5x^2 + 1/25x - 2/125$

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

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

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

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

$\frac{2 \pm \sqrt{0}}{2}$

$\frac{2+0}{2}$ or $\frac{2-0}{2} = m_1$ or m_2

$m_1 = 1$ or $m_2 = 1$

$\therefore y = e^x(A + Bx) \Rightarrow C.F$

P.I

$f(x) = 4\sin x$, $y = (C\cos x + D\sin x - x)$

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

$d^2y/dx^2 = -C\cos x - D\sin x$

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

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

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

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

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

$2C = 4$

$C = 4/2$, $C = 2$

$-2D = 0$, $D = 0$

$\therefore y = 2\cos x + 0 \cdot \sin x$

$y = 2\cos x \Rightarrow P.I$

G.S = CF + PI

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

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

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

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

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

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

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

$m = \frac{-4 \pm 2i}{2}$

$m = -2 \pm 1i$

$\therefore y = e^{-2x}(A\cos x + B\sin x) \Rightarrow C.F$

P.I

$f(x) = 2e^{-2x}$, $y = Ce^{-2x}$

$dy/dx = -2Ce^{-2x}$

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

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

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

$e^{-2x}(4C - 8C + 5C) = 2e^{-2x}$

$C = 2$

$\therefore y = 2e^{-2x}$

G.S = CF + PI

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

$dy/dx = -2e^{-2x}(A\cos x + B\sin x) - 4e^{-2x}$

$x = 0$, $y = 1$ and $dy/dx = -2$

$1 = e^{-2(0)}(A\cos(0) + B\sin(0)) + 2e^{-2(0)}$

$-2 = -2e^{-2(0)}(A\cos(0) + B\sin(0)) - 4e^{-2(0)}$

$1 = 1(A + 0) + 2$