SUNNY OCHENERUTE COLLINS

7.00 ELECT/ELECT

16/ENG04/070

8.00 ENG381

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

10.00

C.F.; $m^2 - m - 2 = 0$

11.00 $m(m-2) + 1(m-2) = 0$

$m = -1$ or $2$

12pm $y = Ae^{-x} + Be^{2x}$

P.I; let $y = C$

1.00 $\frac{dy}{dx} = 0$ ; $\frac{d^2y}{dx^2} = 0$

2.00

$0 - 0 - x = 8$

3.00 $-x = 8$, $C = -4 = 4$

General solution =

4.00 $y = Ae^{-x} + Be^{2x} - 4$

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

6.00 C.F; $m^2 - 4 = 0$

$m = \pm 2$

7.00 $y = C\cosh 2x + D\sinh 2x$

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

8.00 $\frac{dy}{dx} = 3Ce^{3x}$ ; $\frac{d^2y}{dx^2} = 9Ce^{3x}$

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

$5Ce^{3x} = 10e^{3x}$

$C = 2e^{3x}$

Notes

G.S; $y = C\cosh 2x + D\sinh 2x + 2e^{3x}$

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

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

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

$m = -1$ twice

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

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

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

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

$4C - 4C + C = 1$

$C = 1$

P.I; $y = 1e^{-2x}$

G.S; $y = e^{-x}(A + Bx) + e^{-2x}$

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

$m^2 + 25 = 0$

$m^2 = -25$

$m = 5j$

C.F; $y = e^{2x}(A\cos 5x + B\sin 5x)$

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

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

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

$2C + 25E = 0$

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

$D = 1/25$

Notes

$E = -\frac{2}{5} \times \frac{1}{25}$

$E = \frac{2}{125}$

G.S; $y = e^{2x}(A\cos 5x + B\sin 5x) + 1/5x^2 + 1/25x - \frac{2}{125}$

$y = A\cos 5x + B\sin 5x + (x^2 + 1/5x - 2/25)\,1/5$

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

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

$(x-1)(x-1)$

$x = 1$ twice

C.F; $y = e^x(A + Bx)$

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

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

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

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

$-2D = 0$

$2C = 4$ ; $C = 2$

P.I; $y = 2\cos x + 0$

Eq.S; $y = e^x(A + Bx) + 2\cos x$

(6) $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 2e^{-2x}$; $x = 0$, $y = 1$

C.F; $m^2 + 4m + 5 = 0$

$m = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-4 \pm \sqrt{16 - 20}}{2}$

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

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

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

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

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

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

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

$C = 2$; $y = 2e^{-2x}$

Notes

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

If $y = 1$ when $x = 0$

$1 = A + 2$

$A = -1$

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

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

$-2 = B - 2A - 4$

$2 = B - 2A \qquad A = -1$

$2 = B + 2$

$B = 0$

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

$= e^{-2x}(-\cos x + 2) = e^{-2x}(2 - \cos x)$

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

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

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

C.F; $y = Ae^{x} + Be^{-x/3}$

P.I; $y = Cx + D$

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

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

$-2C - Cx - D = 2x - 3$

$-Cx = 2x, \quad C = -2$

$-2C - D = -3$

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

$4 - D = 3$

$D = 7$

P.I; $y = -2x + 7$

G.S; $y = Ae^{x} + Be^{-x/3} - 2x + 7$

**4** Wednesday
155-210

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

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

8.00 $(m-4)(m-2)$

$m = 4, \quad m = 2$

9.00 C-F; $y = Ae^{4x} + Be^{2x}$

P-I; $y = Ce^{4x}$

10.00 $\frac{dy}{dx} = 4Ce^{4x}, \quad \frac{d^2y}{dx} = 16Ce^{4x}$

11.00 $16Ce^{4x} - 6(4Ce^{4x}) + 8(Ce^{4x}) = 8e^{4x}$

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

12pm $0C = 8$

$C = 0$

1.00 G-S; $y = Ae^{4x} + Be^{2x}$

2.00

3.00

4.00

5.00

6.00