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15/ENG04/007
Elect/elect. Eng

Eng 281 Assignment

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

Soln

$m^2 + m - 2 = 0$

$\dfrac{+1 \pm \sqrt{-1^2 - 4 \times 2}}{2}$

$m = +1 \pm \sqrt{9/2}$

$m = \dfrac{1+3}{2}, \quad m = \dfrac{1-3}{2}$

$M = 2$ or $m = 1$

$y = Ae^{-2x} + Be^{-x}$ —— C·F

$y = c$

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

$0 - 0 - 2c = 8$

$-2c = 8$

$\dfrac{8}{2} = c$

$C = -4 \qquad y=$

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

Soln

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

$\dfrac{d^2 y}{dx^2} - 4y = 0$

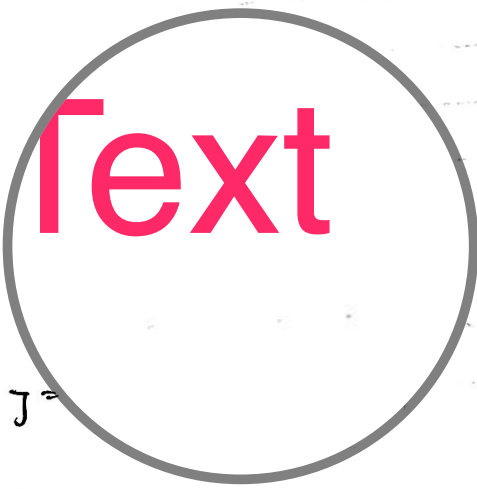$m^2 - 4 = 0$

$m^2 = 4 \qquad m = \pm\sqrt{4}$

$m = \pm 2$

$y = e^0 (C\cosh 2x + D\sinh 2x) - C.F$

P·I

$y = Ae^{3x}$

$\dfrac{dy}{dx} = 3e^{3x} \qquad \dfrac{d^2 y}{dx^2} = 9Ae^{3x}$

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

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

$$\frac{10e^{3x}}{5e^{3x}} = 2$$

$$y = 2e^{3x}$$

General Solution: $y = C\cosh 2x + D\sin 2x + 2e^{3x}$

3) $\dfrac{d^2 y}{dx^2} + 2\dfrac{dy}{dx} + y$

Sol^n

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

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

$$\frac{-2 \pm \sqrt{2^2 - 4}}{2} = \frac{-2}{2} \pm 0 = -1$$

$$M_1 = M_2 = -1$$

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

For P.I

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

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

$$Ce^{-2x}(4 - 4 + 1) = e^{-2x}$$

$$C = \frac{e^{-2x}}{e^{-2x}} = 1$$

$$\therefore y = e^{-2x} \quad \text{——} P.I$$

$$y = e^{-x}(A + Bx) + e^{-2x} \quad \text{—— General Solution}$$

For P.F

$$y = Cx^2 + Dx + E$$

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

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

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

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

$$25C = r$$

$$5 = \frac{1}{c} \qquad —①$$

$$25D = 1$$

$$D = \frac{1}{25} \qquad —②$$

$$25E + 2C = 0$$

$$\frac{2}{5} - (25) = E$$

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

$$y = \frac{1}{5}x + \frac{1}{25}x + \frac{2}{125}$$

Gen sol $= y(\cos 5x + D \sin 5x) + \frac{1}{5}x^2 + \frac{1}{25}x - \frac{2}{125}$

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

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

$$\frac{-2 \pm \sqrt{4-4}}{2} = \frac{-2 \pm 2}{2} = 1$$

$$m_1 = m_2 = 1$$

$$y = e^x(A + Bx) \qquad — C.f$$

For P.f $\quad y = C\cos x + D\sin x$

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

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

$2C = 4C = 2$

$-C + 2D - D = 0$

$2D = 0 \quad D = 0$

$J = 2\cos x + b \sin x = 2\cos x$

Q.s $= y = e^x (A + B + 2\cos x)$

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

$$\text{Soln}$$

$$\dfrac{-b \pm \sqrt{4^2 - 4 \times 5}}{2} \qquad m = \dfrac{-4 \pm \sqrt{-1} \ \sqrt{4}}{2} = \dfrac{-4 \pm J \, 2}{2}$$

$m_1 = -2 + J \qquad m_2 = -2 - J$

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

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