

ASITA ODOMISO

17/ENG06/014

MECHANICAL ENGINEERING

ENG 282 (Assignment 1)

$$\frac{dy}{dx} = -4Ae^{-4x} - 6Be^{-6x} \longrightarrow 1$$

$$\frac{d^2y}{dx^2} = 16Ae^{-4x} + 36Be^{-6x} \longrightarrow 2$$

Solving eqn 1 & 2 simultaneously

multiply eqn 1 by 6

$$6\frac{dy}{dx} = -24Ae^{-4x} - 36Be^{-6x} \longrightarrow 3$$

$$\frac{d^2y}{dx^2} = +16Ae^{-4x} + 36Be^{-6x} \longrightarrow 4$$

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

$$\therefore A = \frac{6\frac{dy}{dx} + \frac{d^2y}{dx^2}}{-8e^{-4x}} \longrightarrow 5$$

Substituting eqn 5 into eqn 1

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

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

Multiply through by 2

$$2\frac{dy}{dx} = 6\frac{dy}{dx} + \frac{d^2y}{dx^2} - 12Be^{-6x}$$

$$2\frac{dy}{dx} - 6\frac{dy}{dx} = \frac{d^2y}{dx^2} - 12Be^{-6x}$$

$$-4 \frac{dy}{dx} - \frac{d^2y}{dx^2} = -12Be^{-6x}$$

$$\underline{-4 \frac{dy}{dx} - \frac{d^2y}{dx^2} = B}$$

$$\therefore \frac{-12e^{-6x}}{12e^{-6x}} = B$$

Substitute A and B into the degenerate equation

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

$$y = \frac{6 \frac{dy}{dx} + \frac{d^2y}{dx^2}}{-8e^{-4x}} + \frac{4 \frac{dy}{dx} + \frac{d^2y}{dx^2}}{12e^{-6x}}$$

$$y = \frac{-72 \frac{dy}{dx} - 12 \frac{d^2y}{dx^2}}{96} + \frac{32 \frac{dy}{dx} + 8 \frac{d^2y}{dx^2}}{96}$$

$$y = \frac{-40 \frac{dy}{dx} - 4 \frac{d^2y}{dx^2}}{96}$$

$$96y = -40 \frac{dy}{dx} - 4 \frac{d^2y}{dx^2}$$

$$24y = -10 \frac{dy}{dx} - \frac{d^2y}{dx^2}$$

$$\frac{d^2y}{dx^2} + 10 \frac{dy}{dx} + 24y = 0$$