ASSIGNMENT 1 — SHAPHAN FRANCIS ZIRRA

COMPUTER ENGINEERING — 17/ENG02/028

A. A differential equation is an equation that shows the relationship between an independent variable x and a dependent variable y ~~with one or more derivatives with~~ with respect to one or more derivatives.

Bi. It is a second order differential equation

ii. It is a second order equation because it has two arbitrary constants.

iii. $y = Ae^{-4x} + Be^{-6x}$ --- (i)

$$\frac{dy}{dx} = -4Ae^{-4x} - 6Be^{-6x} \quad \text{--- (ii)}$$

$$\frac{d^2y}{dx^2} = 16Ae^{-4x} + 36Be^{-6x} \quad \text{--- (iii)}$$

$$A = \frac{y - Be^{-6e}}{e^{-4x}} \quad \text{--- (iv)}$$

Sub eqn (iv) into eqn (ii)

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

$$\frac{dy}{dx} = -4y - 2Be^{-6x} \quad ---(v)$$

make B subject of formula

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

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

$$-\frac{1}{2}e^{-6x}\left(\frac{dy}{dx} + 4y\right) = B \quad ---(vi)$$

Subs eqn (iii) into eqn (iv)

$$A = \frac{y - Be^{-6x}}{e^{-4x}}$$

$$A = \frac{y - \left(\frac{1}{2e^{-6x}}\left(\frac{dy}{dx} + 4y\right)\right)e^{-6x}}{e^{-4x}}$$

$$A = \frac{y + \frac{dy}{2dx} + 2y}{e^{-4x}} \quad ---(vii)$$

Subs eqn (vii) and eqn (ii) into eqn (iii)

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

$$= 16\left(\frac{y + \frac{dy}{2dx} + 2y}{e^{-4x}}\right)e^{-4x} + 36\left(\frac{-1}{2e^{-6x}}\left(\frac{dy}{dx} + 4y\right)e^{-6x}\right)$$

$$\frac{d^2y}{dx^2} = 16y + \frac{16dy}{2dx} + 32y - \frac{36dy}{2dx} - 72y$$

$$\frac{d^2y}{dx^2} = 16y + 18\frac{dy}{dx} + 32y - 18\frac{dy}{dx} - 72y$$

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

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

Differential eqn from

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