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17/ENG06/1029
MECHANICAL ENGINEERING.
ASSIGNMENT 1
ENG282

1a A differential equation is a relationship between an independent variable (x) and dependent variable (y) and one or more derivative of y w.r.t to x

E.g $\partial y/\partial x = 2 + y/x$

$\partial y/\partial x = y + y/x$

b $y = Ae^{-4x} + Be^{-6x}$

i) A second order differential equation

ii) A second order differential equation can be formed because it contains 2 constants in the degenerate equation

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

Solution

$\partial y/\partial x = -4Ae^{-4x} - 6Be^{-6x}$ ①

$\partial^2 y/\partial^2 x = 16Ae^{-4x} + 36Be^{-6x}$ ②

Solving eqn ① and ② simultaneously.

Multiply eqn 1 by 6.

$\therefore 6\partial y/\partial x = -24Ae^{-4x} - 36Be^{-6x}$ ③

$\partial^2 y/\partial^2 x = +16Ae^{-4x} + 36Be^{-6x}$ ④

$6\partial y/\partial x + \partial^2 y/\partial x^2 = 8Ae^{-4x}$

$\therefore A = \dfrac{6\partial y/\partial x + \partial^2 y/\partial x^2}{8e^{-4x}}$ ⑤

Substituting eqns into eqn:

$\partial y/\partial x = 4\left(\dfrac{6\partial y/\partial x + \partial^2 y/\partial x^2}{8e^{-4x}}\right)e^{-4x} - 6Be^{-6x}$

$\partial y/\partial x = \dfrac{6\partial y/\partial x + \partial^2 y/\partial x^2}{2} - 6Be^{-6x}$

Multiply through by 2

$2\partial y/\partial x = 6\partial y/\partial x + \partial^2 y/\partial x^2 - 12Be^{-6x}$

$2\partial y/\partial x - 6\partial y/\partial x = \partial^2 y/\partial x^2 - 12Be^{-6x}$

$-4\partial y/\partial x - \partial^2 y/\partial x^2 = -12Be^{-6x}$

$\dfrac{-4\partial y/\partial x - \partial^2 y/\partial x^2}{12e^{-6x}} = B \quad \therefore \dfrac{4\partial y/\partial x + \partial^2 y/\partial x^2}{12e^{-6x}} = B$