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16/ENG06/021
MECHANICAL ENGINEERING
ENG 382

ASSIGNMENT 1

A plate (flat) of mass m falling freely in air with velocity v, is subjected to a downward gravitational force and an upward frictional drag force due to air. If the drag force, F_D is given by eqn (1)

$$F_D = \frac{0.3v^2}{500 + [\ln v]^3}$$

and the terminal velocity is reached when the drag force equals the gravitational force equals the gravitational force, that is $F_D = Mg$ - - - 2

Taking the values of m and g to be 3.5Kg and 9.8 m/s^2 respectively, using a guess value of $V_2 = 0.5 m/s$, employing fixed point Iteration method, develop a matlab program to estimate the terminal velocity. Take the absolute percentage relative error tolerance to be less than or equal to 1E - 11.

Solu

$$F_D = \frac{0.3v^2}{500 + [\ln v]^3} \quad - 0.02v \quad - - \cdot (1)$$

$$F_D = Mg = 3.5 \times 9.8 = 34.3$$

$$Mg \cong 34.3 = \frac{0.3v^2}{500 + [\ln v]^3} - 0.02v$$

Making v^2 subject of formular

$$34.3 + 0.02v = \frac{0.3v^2}{500 + [\ln v]^3}$$

$$0.3v^2 = \frac{[(34.3 + 0.02v) * (500 + [\ln v]^3)]}{0.3}$$

$$V = \sqrt{\frac{[(34.3 + 0.02v) \times (500 + [\ln v]^3)]}{1} \times \frac{10}{3}}$$