

ORUMLWENSE OSUKUYI ERDEST

16/ENG081061

MECHANICAL ENGINEERING

ASSIGNMENT 4

$$F_D = \frac{0.3v^2}{500 + (lv)^3} - 0.02v \quad \dots \dots (1)$$

$$F_D = mg = 3.5 \times 9.8 = 34.3 \quad \dots \dots (2)$$

Equating eqn 1 and 2

$$mg = 34.3 = \frac{0.3v^2}{500 + (lv)^3} - 0.02v$$

Making v^2 subject of formula

$$34.3 + 0.02v = \frac{0.3v^2}{500 + (lv)^3}$$

$$0.3v^2 = (34.3 + 0.02v) * (500 + (lv)^3)$$

$$v^2 = (34.3 + 0.02v) * (500 + (lv)^3) / 0.3$$

$$v = \sqrt{(34.3 + 0.02v) * (500 + (lv)^3) / 0.3}$$

Initial guess value = $v_0 = 0.5 \text{ m/s}$

Absolute % relative error $E_a(\%) < 1E-11$

MATLAB CODES

Command Window

clear

clc

close all

Syms v

v = 0.5

i = 1; Inf

for(i=1);

v(i+1) = ((34.3 + (0.02 * v(i))) * (500 + (log(v(i)))^3)) / 0.3) ^ 0.5;

Ea(i+1) = abs(v(i+1) - v(i)) / v(i+1) * 100;

if Ea(i+1) <= 1E-11

break

end

table = [i v Ea]

The estimated terminal velocity is 304.07 m/s, Substituting in eqn (1) $F_D = 34.3$