

Name: Shokunbi Emmanuel

Dept: Mechanical Engineering

Matri no: 17/ENG061075

Course code: ENG382

Command window

clear

clc

format short

$V = 0.5$

$m = 3.5$

$n = 9.8$

$F = m * n$

$V = \text{sqrt}(((66 * F + 0.02 * V) * (\log(V))^3) + 10 * V + 17150) / 0.3);$

for i = 1:10

iter(i+1) = i

$V(i+1) = \text{sqrt}(((66 * F + 0.02 * V(i)) * (\log(V(i)))^3) + 10 * V(i) + 17150) / 0.3);$

$\text{Err}(i+1) = \text{abs}((V(i+1) - V(i)) / V(i)) * 100;$

if $\text{Err}(i+1) < 1E-4$

break

end

end

table = table(iter, 'V', Err)

OUTPUT

Iter	V	ϵ_m
0	0.5	0
1	239.05	99.701
2	294.17	18.736
3	302.61	2.7894
4	303.85	0.40992
5	304.04	0.060144
6	304.06	0.0088222
7	304.07	0.0012941
8	304.07	0.00018981
9	304.07	2.7842e-05
10	304.07	4.0238e-06
11	304.07	8.7865e-08
12	304.07	1.2888e-08
13	304.07	1.8904e-09
14	304.07	2.7727e-10
15	304.07	4.0679e-11
16	304.07	5.9635e-12

Converging at iter = 7; $V = 304.07$

Prandtl

$$\bar{F}_D = \frac{0.3V^2}{500 + (17V)^3} - 0.02V \quad \text{--- (1)}$$

if $V = 304.07$

$$\text{Re corr } \bar{F}_D = \rho \times c_1 = 9.81 \times 3.5 = 34.30 \text{ N}$$

Substituting $V = 304.07$ into eqn (1)

$$\therefore \bar{F}_D = \frac{0.3(304.07)^2}{500 + (17(304.07))^3} - 0.02(304.07)$$

$$\bar{F}_D = 40.38195931 - 6.0814$$

$$\bar{F}_D = 34.3 \text{ N}$$