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# **MATRIC NUMBER: 17/ENG06/085**

# **DEPARTMENT: MECHANICAL ENGINEERING**

# **COURSE TITLE: FLUID MECHANICS II**

# **COURSE CODE: MEE322**

# **LECTURER(S) IN CHARGE: Engr. ROMINIYI**

# **ASSIGNMENT 1**

# QUESTION 1

* 1. The three conditions for a coutte flow are:
* Pressure gradient is constant
* The flow is uniform
* The flow is steady
  1. Four (4) conditions that can be used to determine the nature of flow are given by Reynolds experiment as:
* The diameter of the pipe(m)
* The density of the fluid passing through the pipe(kg/m3)
* The viscosity of the fluid(Ns/m2)
* The velocity of the flow(m/s)
  1. The differences between aero foil and hydrofoils are enlisted below:

|  |  |
| --- | --- |
| AEROFOIL | HYDROFOIL |
| * The aero foil is a lifting device mainly used in gaseous fluids(air in particular) | * The hydrofoil is a lifting device mainly utilized in liquid fluids( water) |
| * The aero foil is mainly used for lifting of airplanes and jets. | * The hydrofoil is mainly used to overcome drag and make machines move with a higher velocity in water. |

1. Given: µ= 0.9 centipoise= 0.9 x 10-2 poise = 0.9 x 10-3 Ns/m2

U= 1m/s

b= 10mm=0.01m

dp= 60 KN/m2

dx= 60m

therefore the pressure difference gradient is = = = -1 x 103 N/m3

* 1. Velocity distribution= u =
  2. Discharge per unit width = q=
  3. Shear stress at upper plate is located at y=b,

τ =

τ =

# QUESTION 2

Given: µ= 0.9Ns/m2

b= 10mm=0.01m

ρ= 1260kg/m3

P1= 250KN/m2

U= -1.5m/s

P2= 80KN/m2

=

But

1m

1m

Because the two plates are aligned at an angle of 45 degrees, the above diagram can be used to calculate the change in x

By Pythagoras theorem,

Therefore,

= = = -128.948KN/m3

1. Velocity distribution= u =

Shear distribution= τ =

1. Maximum flow velocity

At maximum flow velocity,

1. Shear stress at upper plate is located at y=b

Therefore, τ = 509.74 – (1.289 x 105 )y