Menofia University
Faculty of Engineering Shebien El-kom
Basic Engineering Science Dept.
First semester Examination, 2017-2018
Date of Exam: 21 / 05 / 2017

Subject: Fluid Mechanics.
Code: BES 645
Year: Master (Grade 600)
Time Allowed: 3 hrs.
Total Marks: 100 Marks

Answer the following questions

Question 1 **(25 marks)**

(A) Derive the continuity Navier-Stokes equations in Cartesian coordinates for laminar flow and put it in dimensionless form. Then Write the special cases of the equations for:

(i) incompressible flow, **(ii)** steady incompressible flow.

(B) Derive the Navier-Stokes equation in Cartesian coordinates for turbulent flow and put it in dimensionless form. Then Explain how to develop the turbulent Reynolds stresses matrix.

Question 2 **(25 marks)**

1. Estimate the Boundary layer thickness (δ).
2. Estimate the wall (skin) friction coefficient in Cartesian coordinates.
3. Estimate the friction drag and drag coefficient in Cartesian coordinates.

Question 3 **(25 marks)**

Write short notes on:

1. Continuum Hypothesis.
2. Mean free path.
3. Classifications of flow phenomena.
4. Geometric and Dynamic similarity
5. Characteristic parameters of Boundary layer.
6. Define dimensionless numbers? What is the purpose of dimensionless equations? Why is it necessary?
7. Give three examples of dimensionless numbers dealing with Fluid Mechanics?
8. Give three examples of dimensionless numbers dealing with heat transfer?
9. What is the Blake number and the capillary number?

Question 4

Determine the stagnation point, contour equation, maximum half thickness coefficient and pressure coefficients on contour surface for

1. Ranking half body.
2. Fixed cylinder.
3. Rotating cylinder.

This exam measures the following ILOs											
Question Number	Q1-1	Q1-2	Q1-3	Q1-4	Q3-1,2,3	Q4-1,2,3			Q2-a	Q2-b	
Skills	Q1-5										
	Knowledge &understanding skills				Intellectual Skills				Professional Skills		

Good Luck

Asst. Prof. Dr. Islam M. Eldesoky *Dr. Eng. Ramzy M. Abumandour*