BMM4783 :- Quiz#1

FACULTY OF MECHANICAL ENGINEERING

BMM4783 COMPUTATIONAL FLUID DYNAMICS

QUIZ #1

Answer the following questions in 30 mins.

1. List at least three advantages of using CFD. **(6 Marks)**

2. What are the three disciplines that CFD integrates? Explain. **(3 Marks)**

3. Consider the following general three dimensional continuity equation;

$$\frac{\partial \rho}{\partial t}+\frac{\partial(\rho u)}{\partial x}+\frac{\partial(\rho v)}{\partial y}+\frac{\partial(\rho w)}{\partial z}=0$$

   Show that it can be simplified to the following for the two-dimensional and incompressible case,

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0$$

   (3 Marks)

4. A simplified one-dimensional inviscid, incompressible, laminar flow is defined by the following momentum equation in the *x*-direction: $\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}=-\frac{\partial p}{\partial x}$. Name each term and discuss their contribution to the flow. **(3 Marks)**

5. Consider two-dimensional steady, incompressible plane viscous flow between fixed parallel plates a distance *h* apart as shown below. We assume that the plates are very wide and very long, so that the flow is essentially in the x direction. The vertical component of the flow is zero. Moreover, no velocity gradient along the *x*-direction (fully-developed flow throughout).

   i. Calculate the velocity fields, **(6 Marks)**

   ii. Draw the velocity profile, u(y) at any position x. **(3 Marks)**

6. State and discuss the three main elements involved in a complete CFD analysis? **(3 Marks)**