

The Open University of Sri Lanka
 B.Sc/B.Ed. Degree Programme
 Continuous Assessment Test (NBT) - 2016/2017
 Applied Mathematics-Level 05
 APU3150/APE5150 – Fluid Mechanics



Duration:-One hour

Date:-28.10.2017

Time:- 1:00p.m.-2:00p.m.

Answer **all** questions and also **note that standard notation is used throughout the paper.**

1. (a) Briefly describe the each of the followings:
 - i. Steady and Un-steady flows
 - ii. Compressible and Incompressible flows
 - iii. Rotational and Irrotational flows.
- (b) Show whether the fluid flow field given by $\mathbf{q} = e^x[(\sin z - \cos y)\mathbf{i} + \sin y\mathbf{j} + \cos z\mathbf{k}]$ is an incompressible fluid. Furthermore show that the motion is irrotational, and verify the Laplace equation on velocity potential.

2. A velocity field is given by $\mathbf{q} = \alpha x\mathbf{i} - \alpha y\mathbf{j}$, where $\alpha = 0.3$.
 - (a) Obtain an equation for streamlines in xy plane.
 - (b) Plot the streamline passing through the point (2, 8).
 - (c) Determine the velocity of a particle at the point (2, 8).
 - (d) If the particle passing through the point (2, 8) is marked at time $t = 0$, determine the location of the particle at $t = 6$.
 - (e) What is the velocity of this particle at $t = 6$.

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