

THE OPEN UNIVERSITY OF SRI LANKA

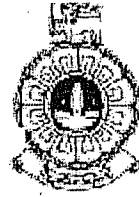
B.Sc. /B.Ed. Degree Programme

APPLIED MATHEMATICS-LEVEL 05

APU3150/APE5150- Fluid Mechanics

OPEN BOOK TEST 2016/2017

Duration: One Hour



Date:-23.09.2017

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 $t = 6$.

