7. A sphere is moving through an infinite fluid at rest at infinity, find the pressure distribution on it. 14

Unit IV

8. (a) Show that the stream function and velocity potential of a two-dimensional vortex flow satisfies the Laplace's equation. 4

(b) State and prove Buckingham π-theorem. 10

9. (a) Describe the following boundary layer parameters :

(i) Boundary layer thickness

(ii) Displacement thickness. 8

(b) Describe the problem of boundary layer along a flat plate. 6

Roll No. .....

(07/21-II)

11675

M. Sc. (2 Year) EXAMINATION

(For Batch 2017 Only)

(Fourth Semester)

MATHEMATICS

MTHCE-2406

Advanced Fluid Mechanics

Time : Three Hours *Maximum Marks : 70*

Note : Attempt *Five* questions in all, selecting *one* question from each Unit and Question Number 1 is compulsory. All questions carry equal marks.

1. (i) Describe stream function for the two-dimensional motion.

(ii) Describe the image of a source with respect to a line.

(iii) State Milne-Thomson circle theorem.

(iv) Describe impulsive motion of a fluid.

(v) Define circular and rectilinear vortices.

(vi) Define the term pressure coefficient.

(vii) Describe Prandtl's boundary layer.

2×7=14

Unit I

2. (a) Show that the curves of a constant velocity potential and constant stream function cut orthogonally at their points of intersection. 7

(b) Define complex potential and find the flow for which the complex potential is $w = z^2$. 7

3. (a) Find the complex potential due to a doublet in two dimensions. 7

(b) Find the image of a source with regard to a circle. 7

Unit II

4. (a) If an elliptic cylinder moves in an infinite liquid with velocity U parallel to the x-axial plane through the major and minor axis of a cross-section, then find the velocity potential and stream function. o10

(b) Find the kinetic energy T when an elliptic cylinder moves in an infinite liquid with velocity U parallel to x-axis. 4

5. (a) State and prove theorem of Blasius. 10

(b) For a uniform line source along the axis of x, find the Stokes' stream function. 4

Unit III

6. (a) Describe the velocity potential for a motion of a sphere through an infinite fluid at rest at infinity. 7

(b) Determine the equations of line of flow when a sphere is at rest and the liquid flow past the sphere with velocity U. 7