AF-3566

M.A./M.Sc. (Final)
Term End Examination, 2017-18

MATHEMATICS

Paper - VI

Fluid Mechanics

Time : Three Hours] [*Maximum Marks* : 100
[*Minimum Pass Marks* : 36

Note : Answer any **five** questions. All questions carry equal marks.

1. The velocity components for a two dimensional fluid system can be given in the Eulerian system by $u = 2x + 2y + 3t$, $y = x + y + \frac{1}{2}t$. Find the displacement of a fluid particle in the Lagrangian system.

2. (*a*) The velocity vector q is given by $q = ix - jy$. Determine the equation of streamlines.

(*b*) Find the equation of streamlines for the flow $q = -i\,(3y^2) - j\,(6x)$ at the point (1, 1).

3. State and prove Bernoulli's theorem.

4. Show that $\frac{x^2}{a^2}\tan^2 t + \frac{y^2}{b^2}\cot^2 t = 1$ is a possible form for the boundary surface of a liquid and find an expression for the normal velocity.

5. State and prove Blasius theorem.

6. State and prove Milne-Thomson Circle theorem.

7. Explain the following terms :

(*a*) Equation of motion of a gas

(*b*) Subsonic, Sonic and Supersonic

8. Explain Vortex motion and its elementary properties.

9. Explain the following terms :

(*a*) Stroke's stream function

(*b*) Conformal mapping

(*c*) Rotational motion

10. Explain the following terms :

(*a*) Flow through a nozzle

(*b*) Isentropic gas flow