

BACHELOR OF MECHANICAL ENGINEERING (EVENING) 1st Year 2nd Semester (Old)
Examination

FLUID MECHANICS II

Time: 3 hrs. Full Marks :100

Answer any five questions

1. a) Show that for 2-D irrotational, steady and incompressible flow, both stream function and velocity potential satisfy the Laplace's equation. Also show that iso-stream function lines and iso-potential lines in such a flow intersect at right angles. 7
- b) The flow of an incompressible fluid is defined by $u=2$ and $v=8x$. Does a stream function exist? If so, find its expression. 6
- c) Does a velocity potential $\phi=2(x^2+2y-y^2)$ describe the possible flow of an incompressible fluid? If so, find the equation for the velocity vector and the streamlines. 7

2. a) What do you mean by a vortex flow? Obtain the expressions for streamlines and velocity potentials for such a flow. 8
- b) A source and a sink of equal strength are placed at equal distances from the origin on either side of the x-axis. Obtain the expressions for streamlines and velocity potentials for such a flow. 12

3. a) Distinguish between static and stagnation pressures. Obtain the relations between stagnation and critical pressure, temperature and density. 8
- b) Air flows steadily and isentropically in a converging-diverging nozzle. At the throat the air is at 140 kPa and at 60°C. The throat cross sectional area is 0.05 m². At a certain section in the diverging part of the nozzle the pressure is 70 kPa. Calculate the velocity and area of this section. 12