M.A./M.Sc. Examination, 2017
Semester-IV
Mathematics
Course: MMO-41 (A8)
(Computational Fluid Dynamics-II)

Time: Three Hours **Full Marks: 40**

Questions are of value as indicated in the margin.
Notations and symbols have their usual meanings.

Answer any ***four*** questions.

1. Discuss the spread of a plane free jet. Show that the mass flux increases in the downstream as $x^{\frac{1}{3}}$ where x is the distance measured downstream from the slit of the jet. 10

2. Discuss the Blasius solution of the boundary layer flow on a flat plate and calculate the coefficient of skin friction. 10

3. Describe Maccormack's technique for the solution of unsteady two dimensional Euler equations. 10

4. Discuss MAC method for primitive variables approach using staggered grid. Also derive the discretized Poison equation in this formulation. 10

5. Transform the following differential equation:
$$\frac{\partial U}{\partial t}+\frac{\partial F}{\partial x}+\frac{\partial G}{\partial y}=0,$$
from (x, y) plane to (ξ, η) plane and write it in strong conservative form where $\xi=\xi(x, y), \eta=\eta(x, y), t=t.$ 10

6. Find the compact high-order formulas for the wall boundary conditions at all the four walls in the case of flow in a rectangular cavity while solving using stream-function vorticity equations for viscous, incompressible flow. 10

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