Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (AERO/AUTO ENGINEERING)

END SEMESTER EXAMINATIONS, DEC 2016

SUBJECT: FLUID MECHANICS [AAE 2105]

REVISED CREDIT SYSTEM
(06/01/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. An inclined rectangular sluice gate AB is hinged at point B, and rests against a smooth wall at A. By considering per meter width of the gate, compute the fluid force on the gate due to seawater (Density of seawater = 1025 kg/m^3) pressure and the horizontal reaction P exerted by the wall at point A. **(5)**

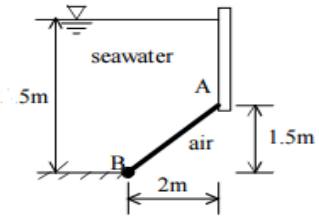

Figure 1.

1B. Define a boundary layer and boundary layer thickness. Sketch boundary layer over a flat plate and mark the different regions of it. **(3)**

1C. Derive the relation between velocity potential function and stream function. **(2)**

2A. A fluid of viscosity 0.8 N-Sec/m^2 and specific gravity 1.25 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is given as 190 N/ m^2 . Determine: **(5)**

(i) The pressure gradient
(ii) Average Velocity
(iii) Reynolds number of the flow.
(iv) Power required to maintain the flow.
(v) Velocity at 20 mm from the wall.

2B. Derive the expression for loss of head due to sudden enlargement of pipe and due to an obstruction in a pipe **(3)**

2C. Show that streamlines and equipotential lines intersect each other orthogonally. **(2)**

3A. Derive the expression for discharge through an Orificemeter. **(5)**

3B. Derive the Euler's equation of motion. **(3)**

3C. A dynamic viscosity of an oil used for lubrication between a shaft and sleeve 6 poise. The shaft is of diameter 0.4m and rotates at 190 r.p.m Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm. **(2)**

4A. State Bernoulli's theorem for compressible flow. Derive an expression for Bernoulli's equation when the process is (i) Isothermal (ii) Adiabatic. **(5)**

4B. Derive the expression for the discharge over a triangular notch or weir. **(3)**

4C. What is momentum equation and momentum of momentum of momentum equation? **(2)**

5A. Prove that the velocity distribution for viscous flow between two parallel plates when the both the plates are fixed across a section is parabolic in nature also prove that the maximum velocity is equal to one and half times the average velocity. **(5)**

5B. With the help of neat diagram explain the Reynolds experiment. Also show the laminar to turbulent phases in it. **(3)**

5C. What do you understand by total pressure and Centre of pressure? **(2)**