

IV SEMESTER B. TECH (IP ENGG.) END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: FLUID MECHANICS AND MACHINERY [MME 2214]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

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Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitable assumed.
- Draw neat labelled sketches wherever necessary.
- 1A. Calculate the dynamic viscosity of oil which is used for lubrication between a square plate of size 0.9m x 0.9m and an inclined plane with the angle of inclination 35°. The weight of square plate is 400N and it slides down with uniform velocity 0.4 m/s. The thickness of the oil film is 2 mm.
- 1B. How fluids can be classified based on the Newton's law of viscosity? Explain 3 with examples.
- **1C.** State and prove Pascal's law and Hydrostatic law.
- 2A. A circular plate 3m in diameter with a concentric hole of 1.5m is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of center of pressure.
- **2B.** Write a short note on stability of floating bodies and submerged bodies. **3**
- 2C. Derive continuity equation for a three dimensional steady flow. Draw a neat 3 labelled sketch if necessary.
- 3A. A pipe of 300mm diameter conveying 0.3m³/s of water has a right angled bend in a horizontal plane. Find the resultant force exerted on the bend if the pressure at inlet and outlet of the bend are 24.525N/cm² and 23.544N/cm² respectively.

- **3B.** Define (i) Reynold's number, (ii) Froude's number, (iii) Euler's number and **3** explain their significance in model testing.
- **3C.** With a neat sketch derive an expression for rate of flow through a horizontal **3** venturimeter.
- 4A. The pressure difference Δp due to turbulent flow depends on pipe diameter 4
 D, length I, the velocity V, viscosity µ, density ρ, and roughness k. Using Buckingham's π theorem obtain an expression for Δp.
- **4B.** Explain (i) Boundary layer (ii) Lift (iii) Drag
- 4C. With a neat sketch derive Darcy-weisbach Equation to calculate frictional 3 losses in a pipe flow. How coefficient of friction is determined for a laminar flow?
- 5A. A Pelton wheel is having a mean bucket diameter of 1m and is running at 1000 rpm. The net head on the Pelton wheel is 700m. If the side clearance angle is 15⁰ and discharge through nozzle is 0.1m³/s, find (i) Power available at the nozzle, (ii) Hydraulic efficiency of the turbine.
- **5B.** Explain the principle of working of centrifugal pump.
- 5C. With a neat sketch derive an expression for force exerted by a jet on 3 stationary inclined flat plate and stationary curved plate.

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