Code No: RT21212 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, Oct/Nov- 2017
MECHANICS OF FLUIDS
(Com. to AE, MTE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) What is kinematic viscosity? State its units (3M)
   b) Explain the terms stream function and velocity potential function (4M)
   c) What is Vortex flow? Explain. (4M)
   d) Define mach number. (3M)
   e) Explain the significance of Reynolds number (4M)
   f) Explain the types of drag. (4M)

PART -B

2. A hydraulic lift used for lifting automobiles has a 25cm diameter ram which slides in a 25.018cm diameter cylinder, the annular being filled with oil having a kinematic viscosity of 3.7cm^2/s and relative density of 0.85. If the rate of travel of the ram is 15cm/s find the frictional resistance when 3.3m of ram is engaged in the cylinder (16M)

3. For a three dimensional flow field described by $V = (y^2 + z^2)\boldsymbol{i} + (x^2 + z^2)\boldsymbol{j} + (x^2 + y^2)\boldsymbol{k}$ find at (1,2,3) (i) the components of acceleration, (ii) the components of rotation (16M)

4. A conical tube is fixed vertically with its smaller end upwards. The velocity of flow down the tube is 4.5 m/s at the upper end and 1.5m/s at the lower end. The tube is 1.5m long and the pressure head at the top end is 3.1m of the liquid. The loss in the tube expressed as a head is $0.3\frac{(V_1 - V_2)^2}{2g}$ where V_1 and V_2 are the velocities at the upper end and lower ends respectively. What is the pressure head at the lower end? (16M)

5. a) Explain the characteristics of laminar and turbulent boundary layers (8M)
   b) What are the factors effecting boundary layer thickness (8M)

6 A liquid of specific gravity 0.88 and absolute viscosity $6.533X10^{-4}\,N.S/m^2$ flows through a pipe of diameter 0.15m at the rate of 60 litres per second. If the loss of head in 100m length of pipe is 4.56m, determine whether the pipe is rough or not (16M)

7. Air of mass 3kg expands from an initial state P_1 = 1000 kPa(abs) and T1= $250^0 C$ to a final state of 200kPa(abs). Find the initial volume, final volume, temperature and the work done in i) isothermal and ii) isentropic expansions. Take k=1.4 and $R = 287\,J/kg - k$ (16M)
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