Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, DEC 2015/JAN 2016

SUBJECT: FLUID MECHANICS [AAE 361]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

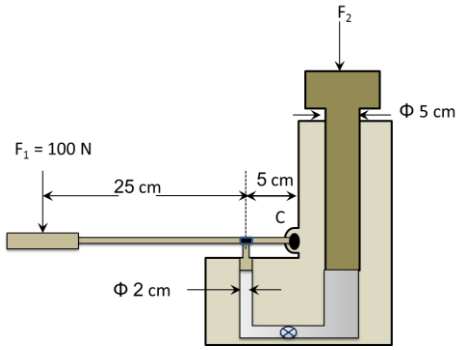
1A. A vertical cylindrical tank with a diameter of 12 m and height 4 m is filled to the brim with water at 20°C. If the water is heated to 50°C, how much water will spill over? Given the specific volume of water, At 20°C, v=0.0010017 m^3/kg, At 50°C, v=0.0010121 m^3/kg. **(03)**

1B. Derive the expression for the capillary rise of water in a glass tube. **(04)**

1C. Distinguish between dilatant and pseudoplastic type of fluids. **(03)**

2A. Using a neat sketch, explain the working of a piezometer. **(03)**

2B. A hydraulic jack has the dimensions shown. If one exerts a force of 120 N on the handle of the jack, what load can the jack support? Neglect lifter weight. **(03)**



2C. A sliding gate 2 m wide and 1.5 m high lies in a vertical plane and has a coefficient of friction of 0.3 between itself and guide-ways. If mass of the gate is 1200 kg, find out the vertical force required to raise the gate when its upper edge is at a depth of 4 meters from the free surface of water. **(04)**

3A. Explain the concept of streamlines in fluids with neat sketch and provide the equation for a streamline. **(03)**

3B. A block of material of unknown volume is submerged in water and found to weigh 300 N (in water). The same block weighs 700 N in air. Calculate the specific gravity of the material. **(03)**

3C. A 40 cm diameter pipe circulates water at a rate of 400 liters per second. If the **(04)**

pipe is bent by 135°, find the magnitude and direction of the resultant force on the bend. Assume the pressure of flowing water to be 29.43 N/cm^2.

4A. Resistance '*R*' to the motion of a completely submerged body is given by below relation where '*ρ*' and '*ν*' are density and kinematic viscosity of the fluid, '*L*' is the length of the body, '*V*' is the velocity of the flow. **(04)**

$$R = \rho V^2 L^2 \emptyset\left(\frac{VL}{\nu}\right)$$

If the resistance of a one-eighth air-ship model when tested in water at 12 m/s is 220 N. what will be the resistance in air of the air ship at the corresponding speed? Kinematic viscosity of air is 13 times that of water and density of water is 810 times of air.

4B. List the forces that influence the characteristics of fluid flow. **(02)**

4C. In a pipe of 300mm diameter and 800 m length, oil of specific gravity 0.8 is flowing at the rate 0.45 m^3/s. Find: **(04)**

a. Head loss due to friction
b. Power required to maintain the flow. Take *v* of oil as 0.3 stokes.

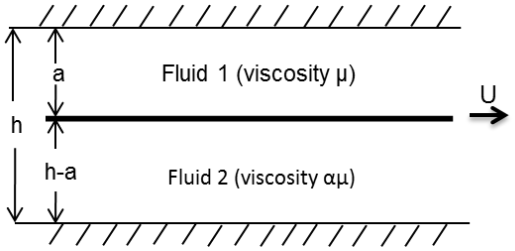
5A. Explain the working of Venturimeter with a neat sketch and derive the expression for discharge. **(05)**

5B. A rectangular channel 1.5 m wide has a discharge of 0.2 m^3/s, which is measured by a right-angled V-notch. Find the position of the apex of the notch from the bed of the channel if the maximum depth of water is not to exceed 1 m. Assume 'C_d' = 0.62 **(02)**

5C. In a pipe of diameter 350 mm and length 75 mm water is flowing at a velocity of 2.8 m/s. find the head lost due to friction using: **(03)**

a. Darcy- Weisbach formula.
b. Chezy's formula for *C*= 55.

6A. A large thin plate is pulled at constant velocity '*U*' through a narrow gap of height '*h*'. on one side of the plate is oil of viscosity '*μ*' and on the other side oil of viscosity, '*αμ*', where '*α*' is a constant. Calculate the position of the plate for minimum drag force. **(04)**



6B. Write short notes on: **(06)**

a) Transmission efficiency in pipes
b) Mach number
c) Pitot - static tube
d) Bluff bodies
e) Syphon
f) Boundary layer