Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC-Semester –III (May-2012) Examination

Subject code: X31901

Subject Name: Fluid Mechanics

Date: 14/05/2012

Time: 02.30 pm – 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Explain the causes of viscosity in: (i) gases, and (ii) liquids? Also explain effect of temperature on viscosity of gases and liquids.	**07**
	(b)	A central plate of area 8 m^2 as shown in Fig.1 is being pulled with a force of 200 N. Determine the velocity with which the central plate will move if the dynamic viscosity of the oil is 0.12 $N.s/m^2$. Neglect thickness of moving plate.	**07**
Q.2	**(a)**	Explain U-tube manometer with neat sketch. Also state advantages and limitations of manometers.	**07**
	(b)	A U-tube manometer contains the mercury as menometric liquid. One end of manometer is connected to a pipe in which a fluid of specific gravity 0.9. The level of mercury in right limb is 12 cm above the centre of pipe. Calculate pressure of fluid in a pipe when the difference of mercury level in two limbs is 20 cm.	**07**
		OR	
	(b)	A rectangular plate 1.5 m wide and 4 m long is immersed in water in such a way as (a) horizontally 2 m below the free surface of water (b) vertically, 1.5 m side is parallel to the water surface and 2 m below the free surface of water. Find (i) total pressure on the plate and (ii) position of centre of pressure.	**07**
Q.3	**(a)**	Explain stability criteria of submerged and floating bodies.	**07**
	(b)	Give detailed classification of fluid flow.	**07**
		OR	
Q.3	**(a)**	A pipe *A* 350 mm in diameter, branches into two pipes (*B* and *C*) of diameters 200 mm and 150 mm respectively. If the average velocity in pipe *A* is 2.5 m/s, determine: (i) discharge through pipe *A*, and (ii) velocity in pipe *C* if the average velocity in pipe *B* is 2 m/s.	**07**
	(b)	A pipe line carrying oil of specific gravity 0.92, changes in diameter from 200 mm at a position *1* to 400 mm at a position *2* which is 5 meters at a higher level. If the pressure at *1* and *2* are 14 N/cm^2 and 8 N/cm^2 respectively and the discharge is 300 liters/s. Calculate the loss of head and direction of flow.	**07**
Q.4	**(a)**	Explain flow net and give its importance.	**07**
	(b)	Derive an expression for the discharge through a Venturimeter with usual notations.	**07**
		OR	

Q.4 **(a)** The efficiency of fan (η) depends upon diameter of rotor (D), discharge of fluid (Q), density of fluid (ρ), dynamic viscosity of fluid (μ) and angular velocity of rotor (ω). Find expression for η in terms of dimensionless parameters. **07**

(b) Derive expression for following non-dimensional numbers: **07**

(i) Reynolds number, (i) Froude's number, (iii) Mach number.

Q.5 **(a)** A laminar flow is taking place in a pipe of diameter of 250 mm. The maximum velocity is 2.3 m/s. Determine the mean velocity and the radius at which this occurs. Also calculate the velocity at 4 cm form the wall of the pipe. **07**

(b) Explain Saybolt viscometer with neat sketch. **07**

OR

Q.5 **(a)** Explain Moody's diagram for calculating the head loss due to friction. **07**

(b) Explain propagation of disturbance in compressible fluid with (Mach No.) M = 1, M < 1, and M > 1. **07**

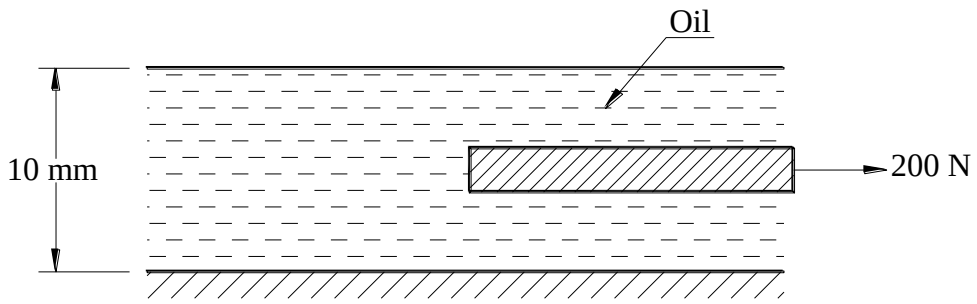

Fig. 1(Q. 1(b))

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