b) Air is flowing over a flat plate 500 mm long and 600 mm wide with a velocity of 4 m/s. The kinematic viscosity of air is given as 0.15×10^{-4} m^2/s. Find i) the boundary layer thickness at the end of the plate, ii) Shear stress at 200 mm from the leading edge and iii) drag force on one side of the plate. Take the velocity profile over the plate as $u/U = \sin(\pi/2.y/\delta)$ and density of air is 1.24 kg/m^3. **(13)**

15. a) Discuss about Buckingham's π theorem. State the procedure for solving problems. **(13)**

(OR)

b) Define Similitude and discuss its types of Similarities in detail. **(13)**

PART – C **(1×15=15 Marks)**

16. a) A standard basketball (mass = 624 grams ; 24.3 cm in diameter) is held fully under water. Calculate the buoyant force and weight. When released, does the ball sink to the bottom or float to the surface ? If it floats, what percentage of it is sticking out of the water ? If it sinks, what is the normal force, FN with which it sits on the bottom of the pool ?

(OR)

b) Explain the various applications of Bernoulli's Equation.

22/11/17 FN

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50256

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Third Semester
Environmental Engineering
CE 6303 – MECHANICS OF FLUIDS
(Common to Environmental Engineering)
(Regulations 2013)

Time : Three Hours Maximum : 100 Marks

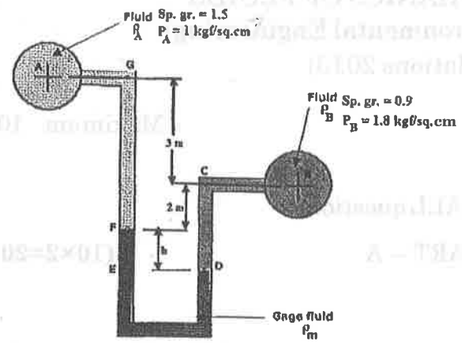
Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Differentiate Density and Viscosity.
2. Define the relationship between Absolute and Gauge Pressure.
3. Define Stream Line.
4. Explain the Continuity Equation.
5. Differentiate Major and Minor Headloss.
6. Define H.G.L.
7. Explain the term "Boundary Layer".
8. List out the Methods of Preventing the Separation of a Boundary Layer.
9. Explain the term "Dimensionless Numbers" and list any 2 Dimensionless numbers.
10. Define Model and Model Analysis.

PART – B **(5×13=65 Marks)**

11. a) A differential manometer is connected at the 2 points A and B of 2 pipes as shown in fig. The pipe A contains a liquid of sp. gr. = 1.5 while pipe B contains a liquid of sp. gr. = 0.9. The pressures at A and B are 1 kg.f/cm^2 and 1.8 kg. f/cm^2 respectively. Find the difference in mercury level in the differential manometer. **(13)**



(OR)

b) i) The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm. **(8)**

ii) Explain the following terms : **(5)**

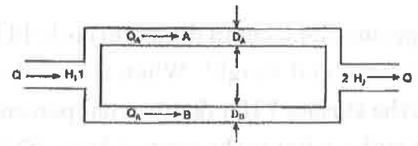
1) Mass Density
2) Specific Weight
3) Specific Volume
4) Specific Gravity

12. a) Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C, pipe branches. Branch CD is 0.8 m in diameter and carries one-third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE. **(13)**

(OR)

b) The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 lps. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2. **(13)**

13. a) A Main Pipe divides into 2 parallel pipes which again forms one pipe as shown in fig. The length and diameter for the 1st parallel pipe are 2000 m and 1 m respectively, while the length and diameter of 2nd parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe, if the total flow in the main is 3 m^3/s. The coefficient of friction for each parallel pipe is same and equal to 0.005. **(13)**



(OR)

b) Determine the rate of flow of water through a pipe of diameter 20 cm and length 50 m when one end of the pipe is connected to a tank and other end of the pipe is open to the atmosphere. The pipe is horizontal and the height of water in the tank is 4 m above the centre of the pipe. Consider all minor losses and take f = 0.009 in the formula $h_f = \frac{4.f.L.V^2}{2gd}$. **(13)**

14. a) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/U = y/\delta$, where u is the velocity at a distance y from the plate and u = U at $y = \delta$, where δ = boundary layer thickness. Also calculate the value of δ^*/θ. **(13)**

(OR)