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[4957]-1014**S.E. (Mechanical/Automobile Engg.) EXAMINATION, 2016****FLUID MECHANICS****(2012 PATTERN)****Time : Two Hours****Maximum Marks : 50**

- N.B. :—** (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
(ii) Neat diagrams must be drawn wherever necessary.
(iii) Figures to the right indicate full marks.
(iv) Use of calculator is allowed.
(v) Assume suitable data, if necessary.

1. (a) Explain the following fluid properties in brief : [6]
(i) Capillarity
(ii) Surface Tension
(iii) Vapor Pressure.
(b) Prove that the centre of pressure of a plane surface is always below the centre of gravity when immersed in liquid. [6]

Or

2. (a) One litre of oil weight 8 N. Calculate its specific weight, specific volume and relative density. [6]
(b) A stream function for two dimensional flow is given by

$$\psi = 3x^2 - y^2.$$
Determine equation of streamline. Find the components of velocity at (2, 2). [6]

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3. (a) With a neat sketch describe the working of a Prandtl's static Pitot Tube. [6]
- (b) Curde oil of relative density 0.9 is pumped through a smooth horizontal pipe 400 m, long 100 mm diameter. Kinematic viscosity of oil is 2.5 stokes differential pressure head between two ends of the pipe is 16.31 m of oil. Assuming the flow of oil to be laminar, find :
- (i) Rate of flow of oil through pipe and
- (ii) Power required to maintain the flow. [6]

Or

4. (a) With the help of neat sketches, explain how pipe boundaries behave hydro dynamically smooth and rough ? [6]
- (b) At a point in the pipeline where the diameter is 20 cm, the velocity of water is 4 m/sec and the pressure is 3.5 bar. At a point 15 m downstream, the diameter reduces to 10 cm. Calculate the pressure at this point, if the pipe is :
- (i) Horizontal
- (ii) Vertical with flow downward and
- (iii) Vertical with flow upward. [6]
5. (a) What is siphon ? Where it is used ? Explain its working. [6]

- (b) The pressure drop through a diffuser depends on rate of flow, inlet area, exit area and fluid density. Obtain the relation between appropriate dimensionless parameters to describe the flow conditions. [7]

Or

6. (a) State and write Reynolds law for models and state giving examples where it can be used. Derive an expression for discharge ratio and power ratio for Reynolds model law. [7]
- (b) Three pipes 300 m long, 300 mm diameter; 150 m long, 200 mm diameter and 200 m long, 250 mm diameter are connected in series in the same order. Pipe having 300 mm diameter is connected to reservoir. Water level in the reservoir is 15 m above the pipe axis which is horizontal. The respective friction factors for three pipes are 0.018, 0.02 and 0.019. Determine : [6]
- (i) Flow rate
 - (ii) Magnitude of loss of head in each pipe section and
 - (iii) the diameter when the three pipes are replaced by a single pipe (having $f = 0.016$) to give the same discharge.
7. (a) Explain development of lift on an aerofoil. [6]
- (b) Explain the development of boundary layer over a flat plate held parallel to the direction of flow. State the factors affecting growth of boundary layer. [7]

Or

8. (a) A spherical balloon 1.5 m in diameter is filled with hydrogen and held stationary in air by anchoring it to the ground with the help of a string of negligible weight. The balloon is subjected to an upward force of 20 N. Determine the inclination of the string with the ground if the wind is flowing with a velocity of 18 km/hr. Take the mass density of air as 1.2 kg/m^3 and the drag coefficient as 0.5. Also find the tension in the string. [8]
- (b) Explain the concept of boundary layer and state where it is useful. [5]

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