

S.E. Civil III - CBGS

FM-I

9.6.2016

QP Code : 30774

1<sup>st</sup> half 2015

CBGS (3 Hours)

Max Marks :80

- N.B (1) Question No.1 is compulsory  
(2) Solve any three questions of the remaining questions .  
(3) Assume suitable data if required.  
(4) Draw neat figures.

- Q 1) Answer any Four out of the following. 20
- Explain Lagrangian Method and Eulerian method
  - Define mass density, specific mass, specific weight and specific volume.
  - Write short notes on type of fluids.
  - Define co-efficient of Contraction, co-efficient of velocity, co-efficient of discharge. What is the relation between them?
  - Explain flow past a Rankine oval body.
  - Explain circulation and vorticity.
- Q 2) a) A triangular plate of 1 meter base and 1.5 meter altitude is immersed in water .The plane of the plate is inclined at 30° with free water surface and the base is parallel to and at a depth of 2 m from water surface. Find the total pressure on the plate and the position of centre of pressure. 10
- b) The velocity components in a two -dimensional flow field for an incompressible fluid are as follows:  $u=y^3 + 6x - 3x^2y$  and  $v=3xy^2 - 6y - x^3$ . Obtain expression for stream function  $\psi$ . 5
- c) The dynamic viscosity of 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. 5
- Q 3) a) A rectangular pontoon 12 m long, 9 m wide and 3 m deep weighs 1380 kN and float in sea water. The pontoon carries on its upper deck a boiler 6 m in diameter and weighing 864 kN. The centre of gravity of each unit coincides with geometrical centre of the arrangement and lie in the same vertical line. (i) What is the metacentric height? (ii) Is the arrangement stable? 10
- b) State and prove Pascal's law. 06
- c) What is capillarity? Derive expression for height of capillary rise. 04
- Q 4) a) Determine the rate of flow of water through a pipe 300 mm diameter placed in an inclined position where a venturimeter is inserted ,having a throat diameter of 150 mm .The difference of pressure between the main and the throat is measured by a liquid of specific gravity 0.7 in an inverted U-Tube which gives a reading of 260 mm .The loss of head between the main and throat is 0.3 times the kinetic head of the pipe 10
- b) State Bernoulli's theorem for steady flow of an incompressible fluid and state the assumptions made during deriving Bernoulli's equation. 04
- c) Derive an expression for pressure variation in a fluid at rest. 06

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- Q 5) a) A cylindrical vessel closed at the top and bottom is 0.24 m in diameter, 1.44 m long and contains water upto height of 0.96 m. (i) Find the height of paraboloid formed if it is rotated at 480 r.p.m; about its vertical axis. (ii) Find the speed of rotation of the vessel, when axial depth of water is zero. 10
- b) Explain conditions of equilibrium of sub-merged body. 05
- c) Fig 1. shows a differential manometer connected at two points A and B. At A air pressure is 100 kN/m<sup>2</sup>. Find the absolute pressure at B. 05

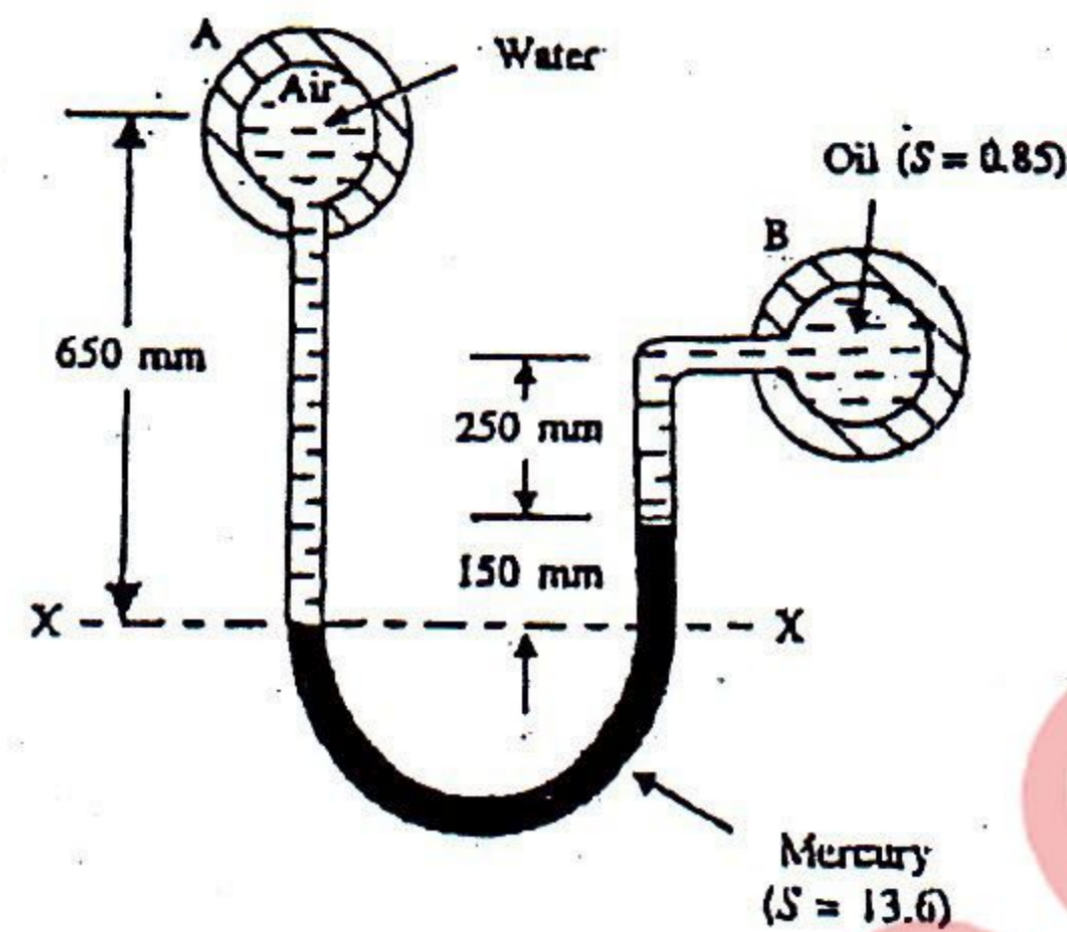


Fig:1

- Q 6) a) A hemispherical tank of 2m radius is provided with an orifice of 40 mm at its bottom. It contains water upto a height of 1.8 m. Find the time required by water (i) to fall from 1.8 m to 1.2 m and (ii) for completely emptying the tank. 10
- b) A broad crested weir of 50 m length has 50 cm height of water above its crest. Find the maximum discharge. Take  $C_d = 0.60$ . Neglect velocity of approach (b) If the velocity of approach is to be taken into consideration, find the maximum discharge when the channel has a cross-section area of 50 m<sup>2</sup> on the upstream side. 05
- c) Write a note on cipolletti weir 05

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