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SE Civil III CBGS- FM-I QP Code : 4770 11.6.15

(Three Hours) 80 Marks

N.B. (i) Question **No. 1** is compulsory

(ii) Attempt any **Three** Questions out of **Five** Questions

(iii) Illustrate with figures whenever necessary

(iv) Assume suitable data if necessary and state it clearly

1(a) Define mass density [2]

(b) State Pascal's law [2]

(c) State Archimedies principle [2]

(d) Explain the term meta-centric height [2]

(e) What is specific gravity [2]

(f) Define the term buoyancy [2]

(g) What do you understand by total pressure and centre of pressure [2]

(h) State Bernoulli's theorem [2]

(i) How are weirs classified [2]

(j) Define an orifice [2]

2(a) Calculate the density, specific weight and weight of one litre of petrol of specific gravity 0.7 [8]

2(b) A vertical sided 1.5 m height tank is square in plan whose side is 1 m long. The tank contains oil of specific gravity 0.8 to a depth of 50 cm floating on 1m depth of water. Determine:

(i) Total pressure on one side of tank
(ii) Height of centre of pressure above base [12]

3(a) A gate 3m wide and 2m high separates a liquid of specific gravity 1.5 and height 2m on one side and water upto height of 1.5m on other side of gate. Find the resultant force acting on the gate and position of centre of pressure [8]

3(b) A metallic body floats at the interface of mercury and water in such a way that 30% of it's volume is submerged in mercury and 70 % in water. Find the density of metallic body [8]

3(c) What are the conditions of equilibrium of a floating body and submerged body [4]

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4(a) A container having dimensions 7m x 2m and 2.5m deep contains water 1.25m deep. The container moves with an acceleration 3m/sec^2 upto a 200 inclined plane. Find the inclination of water surface with horizontal. [6]

4(b) What do you understand by the terms total acceleration, convective acceleration and local acceleration [6]

4(c) What are the methods of describing fluid flow [4]

4(d) The two velocity components for a flow field is given. Find the third velocity component so as to satisfy the continuity equation [4]

$$u = x^2y,\ v = y^2z$$

5(a) Derive Bernoulli's equation from Euler's equation of motion [6]

5(b) A horizontal venturimeter with inlet diameter 10 cm is used to measure the flow of oil of sp.gr. 0.8. The discharge of oil through venturimeter is 60 lit/sec. Find the reading of oil-mercury differential manometer. Take C_d= 0.98 [6]

5(c) Find the speed of submarine moving in sea water for a deflection of 4 cm in a mercury differential manometer which is connected to pitot static tube. Take C_v= 1 and specific gravity of sea water as 1.03 [4]

5(d) Explain classification of orifice [4]

6(a) A suppressed rectangular weir is used to measure rate of flow in a stream 2m wide. The head of water above the weir is 25 cm. the sill of notch is 50 cm above the stream bed. Assuming Cd= 0.62. Find the discharge. Consider velocity of approach [8]

6(b) An external cylindrical mouthpiece of diameter 20 cm is discharging water under a constant head of 8m. Determine the discharge and absolute pressure head of water at vena-contracta. Take Cd= 0.855 and Cc = 0.62 for vena- contracta. Atmospheric pressure head is 10.3 m of water [8]

6(c) State the different devices that one can use to measure the discharge through a pipe [4]