SE - sem-III - CBGS - Civil

FM-I

21/12/15

QP Code : 5283

(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 Solve any FIVE [20]

(a) Define mass density and specific gravity
(b) Prove that the pressure is same in all directions at a point in static fluid
(c) At a certain location in the flow field, pressure equals 50 m of water column. Obtain the equivalent pressure head in term of (i) Kerosene of specific gravity 0.8 (ii) Carbon tetrachloride of specific gravity 1.5.
(d) Define the term Local and Convective acceleration
(e) State a five engineering applications of Bernoullis equation
(f) Determine meta-centric height by experimental method
(g) How are weirs and notches classified?
(h) A head of water over a centre of an orifice of diameter 20 mm is 1 m. The actual discharge through the orifice is 0.00085 m^3/s. Find the coefficient of discharge.

2(a) A cylindrical tank of 3 m height and 5 cm^2 cross sectional area is filled with water upto height of 2 m and remaining with oil of specific gravity 0.8. The vessel is open to atmosphere. Calculate (i) Pressure intensity at interface, (ii) Pressure intensity at base of tank [6]
2(b) A left leg of U- tube mercury manometer is connected to pipeline conveying water, the level of mercury in the leg being 0.6 m below the centre of pipeline, and right leg is open to the atmosphere. The level of mercury in right leg is 0.45 m above that in the left leg and the space above mercury in right leg contains Benzene (specific gravity 0.88) to a height of 0.3m. Find the pressure in the pipe. [6]
2(c) A vertical rectangular gate 6 m high and 4 m wide, has water on one side to a depth of 3m and a liquid of specific gravity 0.85 to a depth of 2 m on the other side. Calculate (i) total pressure exerted on each side of the gate and (ii) resultant hydrostatic pressure both in magnitude and point of application with respect to the bottom. [8]
3(a) A two- dimensional flow is described by the velocity components: $u = 5x^3$ and $v = -15x^2y$ Evaluate the stream function, velocity and acceleration at point P(x= 1 m and y = 2 m) [8]
3(b) Derive the general three- dimensional equation of continuity. [8]
3(c) Define stream line, stream tube, streak line and path line [4]
4(a) Water is flowing through a pipe having diameter 300 mm and 200 mm at bottom and upper end respectively. The intensity of pressure at bottom end is 24.525 N/cm^2 and the pressure at upper end is 9.81 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 40 litre/s. [8]
4(b) Find the discharge of water flowing through a pipe 30 cm diameter placed in an inclined position where a venturimeter is inserted, having a throat diameter of 15 cm. The difference of pressure between the main and throat is measured by liquid of specific gravity 0.6 in an inverted U-tube which gives a reading of 30 cm. The loss of head between the main and throat is 0.2 times the kinetic head of pipe. [8]

4(c) Distinguish between steady flow and unsteady flow [4]

5(a) Derive expression for discharge through large rectangular orifice [6]

5(b) Explain the classification of orifices [6]

5(c) Explain the term doublet, source, sink and uniform flow [8]

6(a) The maximum flow through a rectangular flume 1.8 m wide and 1.2 m deep is 1.65 m^3/s. It is proposed to install a suppressed sharp crested rectangular weir across the flume to measure flow. Find the maximum height at which the weir crest can be placed in order that water may not overflow the sides of the flume. Assume $c_d = 0.6$ [8]

6(b) Define terms stable, unstable and neutral equilibrium [6]

6(c)A 0.25 m diameter pipe carries oil of specific gravity 0.8 at the rate of 120 litres/s and the total pressure at the point A is 19.62 KN/m2. If the point A is 3.5 m above the datum line, calculate the total energy at point A in meters of oil. [6]

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