SE CIVIL/SEM-III/ SH-2022/ R-2019/ 1-12-2022

QP Code - 10012399

(3Hours)   Max Marks=80

Note 1. Question **1** is compulsory
   2. Attempt any **4** out of six questions
   3. Assume any suitable data where ever required

Q.1   Attempt any **four**

a. What is capillarity? Derive expression for height of capillary rise.   05

b. State and prove Pascal's law. (Prove that the pressure is same in all directions at a point in static fluid.)   05

c. What is orifice and mouthpiece? Explain classification of orifices and mouthpieces.   05

d. A projectile is travelling in air having pressure and temperature as 10.1043 N/cm^2 and -10°C at a speed of 1500 km/hour. Find Mach number and the Mach angle. Take k=1.4 and R= 287 J/kg^{o}K   05

e. Short note : condition of stability of floating and submerged bodies   05

Q.2 a. Write short note on : Types of fluid flow   05

b. Define following terms: 05
   a) Bulk modulus
   b) Surface tension
   c) Specific weight
   d) Specific gravity
   e) Mass density

c. A horizontal Venturimeter with inlet diameter 300 mm and throat diameter 150 mm is employed to measure the flow of water. The reading of the differential manometer connected to the inlet is 200 mm of mercury. If the Cd=0.98. Determine the rate of flow.   10

Q.3 a. A broad crested weir of 50 m length has 50cm height of water above its crest. (a) Find the maximum discharge. Take Cd=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^2 on the upstream side.   10

b. A circular tank of diameter 4 m contains water up to a height of 5 m. the tank is provided with an orifice of diameter 0.5 m at the bottom. Find the time taken by water (i) to fall from 4 m to 2 m (ii) for completely emptying the tank. Take Cd =0.6   10

Q.4 a. Determine the total pressure and center of pressure on an isosceles triangular plate of base 4 m and altitude 4 m when it is immersed vertically in an oil of sp.gr. 0.9. The plate coincides with the free surface of oil.   10

b. Describe Archimedes principle. Determine meta-centric height by experimental method and analytical method.   10

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Q.5 a. The velocity components in a two-dimensional flow field for an incompressible fluid   **10**
         are as follow: $u = y^3 + 6x - 3x^2y$ and $v = 3xy^2 - 6y - x^3$. Obtain expression for stream
         function Ψ

     b. Differentiate between: **10**
         (i)   Stream function and velocity potential function
         (ii)   Stream line and streak line

Q.6 a. An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. **10**
         The pressure gauge fitted upstream and downstream of the orifice meter gives reading
         of 19.62 N/cm2 and 9.81 N/cm2 respectively. Co-efficient of discharge for the orifice
         meter is given as 0.60. Find the discharge of water through pipe.

     b. Explain Lagrangian method and Eulerian method   **10**

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