QP Code : 1246

(3 hours)

Note: Max. Marks 100

Question no.1 is compulsory

Solve any 4 questions out of remaining

Assume data wherever necessary and clearly mention the assumptions made.

Draw neat figures as required.

1.   Answer any 4 of the following.   20
   a. Explain Capillarity and derive expression for capillary rise.
   b. Explain Bourdan Pressure Gauge.
   c. Write a note on Hydraulic Coefficients.
   d. Write a note on Pitot Static tube.
   e. Explain Source Sink and Doublet Flow.

2.   a.   Two large plane surfaces are 20mm apart and the gap contains oil of   10
   dynamic viscosity 0.60 Pa. s. A thin plate of cross sectional area 0.50 m^2 is to be
   pulled through the gap at a constant velocity of 0.60 m/s. The location of the plate
   will have to be such that it is 8 mm from one of the surfaces. Neglecting edge
   effects, estimate the force required for pulling the plate as above.

                                                                            10
   b.   State and derive Pascal's Law

3.   a.   A U-tube differential manometer connects two pressure pipes A & B. The   10
   pipe A contains carbon tetra chloride having a specific gravity 1.6 under a
   pressure of 120 kPa. The pipe B contains oil of specific gravity 0.8 under a
   pressure of 200 kPa. The pipe A lies 2.5m above pipe B. Find the difference of
   pressures measured by mercury as fluid filling U-tube.

   b.   A square plate ABCD 5 m x 5 m hangs in water surface from one of its   10
   corner such that one of its diagonal is horizontal. This horizontal diagonal is at a
   distance of 10 m from free water surface. Determine the total pressure on the plate
   and the position of the centre of pressure.

                                                    TURN OVER

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4. a. A rectangular pontoon floating in sea water (density kg/m^3) is 8 m long, 7m broad and 3 m deep. It weighs 600 kN. It carries on its upper deck and employ boiler 4m diameter weighing 400kN. The center of gravity of the pontoon and boiler are at their geometric centers along a vertical line. Is the system stable ? **10**

    b. If the expression for a stream function is described by $\psi = x^3 - 3xy^2$, determine whether flow is rotational or irrigational. If the flow is irrigational, then indicate correct value of velocity potential. (a) $\Phi = y^3 - 3x^2y$; (b) $\Phi = -3x^2y$ **10**

5. a. Find the maximum speed of an open circular cylinder, having 180mm diameter, 1200mm length and containing water upto a height of 960mm, at which it should be rotated about its vertical axis so that no water spills. **10**

    b. State and derive Bernoulli's equation also mention the assumptions made. **10**

6. a. A horizontal Venturimeter 160mm x 180mm is used to measure the flow of an oil of specific gravity 0.8. Determine the deflection of oil mercury gauge, if the discharge of oil is 50liters/sec. Take coefficient of Venturimeter as 1. **10**

    b. A rectangular orifice 0.6m wide and 0.8m deep is discharging water from a vessel. The top edge of the orifice is 0.4m below the water surface in the vessel. Find the discharge through the orifice if C_d = 0.62; also find the percentage error if the orifice is treated as a small orifice. **10**

7. a. A 40m long weir is divided into 12 equal bays by vertical post, each post 0.6m wide. Using Francis formula, calculate the discharge over the weir if the head over the crest is 1.20m and velocity of approach is 2m/sec. **10**

    b. Explain experimental method for determination of metacentric height. **05**

    c. Vapor pressure **05**

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