F.M-I

13/06/14

QP Code : **NP-18779**

(3 hours) [Total Marks : 80

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** questions out of remaining **five** questions.
(3) **Illustrate** answers with neat sketches wherever **necessary**.
(4) Assume **suitable** data if **necessary** and state at **clearly**.

1. Attempt any **four** of following :– **20**
   (a) What is manometer ? How they are classified ?
   (b) What are the assumptions made in deriving Bernoulli's equation ? Explain limitations.
   (c) Explain capillarity and surface tension.
   (d) Write a short note on flow past a Rankine oval body.
   (e) Explain discharge over a Broad crested weir.
   (f) What is an orifice and a multipiece ? Give classification of orifices.

2. (a) Describe specific weight and compressibility of fluid. **4**
   (b) Show relationship between dynamic viscosity and velocity gradient. Classify fluids based on this relationship. **6**
   (c) Two large horizontal plane surfaces are 20m apart. This space is filled with glycerene. Find what force is requried to drag a very thin plate of area $0{\cdot}6m^2$ between the two surfaces at a speed of 0·70m/sec. **10**
      (i) If the plate is equidistant from the two surfaces.
      (ii) If the plate is 7·5 mm from the one of the surfaces. Take the dynamic viscosity of glycerene equal to $8{\cdot}04\times10^{-1}$ Ns/m^2.

3. (a) State and prove the pascal's law. **10**
   (b) A hollow cylinder of outer diameter 1 m, inner diameter 0·75 m, weights 2h kN. Where 'h' is the height of cylinder. It is required to float in water with its logitudinal axis vertical. Calculate the height of cylinder. **6**
   (c) Explain the following :– **4**
      (i) Lagrangian method and Exlerian method
      (ii) Stable, unstable and netural equllibrium.

4. (a) Describe conditions of stability of floating body in detail. **10**
   (b) An orifice meter with orifice diameter 10cm is inserted in a pipe of 20cm diameter. The pressure gauges fitted up stream and downstream of the orifice meter gives reading of 19·62 N/cm^2 and 9·81 N/cm^2 respectively. Co-efficent of discharge for the orifice meter is given as 0·6. Find the dischagre of water through pipe. **10**

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5. (a) Define :– 6
   (i) Velocity potential function
   (ii) Steam function.
   (b) Write Archimede's principle and define Metacentre and Metacentric height. 4
   (c) An orifice dia 150mm is fitted at the bottom of a boiler drum of length 8m and of diameter 3m. The drum is horizontal and contained water up to height of 2·4m. Find the time required to empty the boiler. 10

6. Solve any **four** :– 20
   (a) Differntiate between Notch and Wier
   (b) Explain with neat sketch source, sink and doublet
   (c) Write a note on Borda's mouth pieces
   (d) Define specific volume and specific gravity
   (e) Describe cipolleti weir.
