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Reg. No. : .....

Name : .....

Third Semester B.Tech. Degree Examination, November 2014
(2013 Scheme)
13.303 : FLUID MECHANICS – I (C)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

I. a) Explain the terms Metacentre and Metacentric height.

b) Explain Stream function and Velocity potential function.

c) Define a weir and point out the differences between a notch and a weir.

d) Differentiate between Hydraulic gradient line and total energy line.

e) Explain Equivalent pipe diameter applied to flow through pipes. **(5×4=20 Marks)**

PART – B

Answer **all** questions from **each** Module. **Each full** question carries **20** marks.

Module – I

II. a) A square door whose dimension is 0.4 m × 0.4 m is provided on the vertical side of a water tank. What force must be applied at the lower end of the gate to so as to hold the hinged door closed ? The hinged end which is at the top of door lies at a depth of 4 m from free surface of water. Also find the position of center of pressure. **12**

b) What is Metacentric height ? How it influence the stability of a floating body ? **8**

OR

III. a) A circular plate of 3.0 m diameter is immersed in a liquid of relative density 0.8 with its plane making an angle of 30° with horizontal. The centre of the plate is at a depth of 2.75 m from the free surface. Calculate the total pressure on one side of the plate and location of centre of pressure. **10**

b) A solid cylinder of 4 m diameter has a height of 3 m when it is floating in water with its axis vertical. The specific gravity of cylinder is 0.6. State whether it is in stable or unstable equilibrium. **10**

Module – II

IV. a) Distinguish between the Lagragian and Eulerian methods of fluid flow description. **8**

b) In a two-dimensional flow the velocity components are given by $u = x\ 4y$ and $v = -y - 4x$. Check for the existence of velocity potential function and obtain the velocity potential function if it exists. **12**

OR

V. a) Explain the terms :

i) stream line ii) path line and iii) streak line **8**

b) The velocity potential for a two dimensional flow is $\phi = x(2y - 1)$. Determine the velocity at the point P (4, 5). Also obtain the value of stream function at this point P. **12**

Module – III

VI. a) Derive Bernoullis energy equation from first principle and state the assumptions made in the derivation. **10**

b) Water discharges at the rate of 100 litres/sec through a 10 cm diameter orifice with a head of 10 m. A point on the jet measured from vena contracta of the jet has co-ordinate of 4.5 m horizontal and 0.9 m vertical. Find C_d, C_v and C_c. **10**

OR

VII. a) Derive an expression for discharge through a rectangular sharp crested weir. 8

b) Water flows over a right angled triangular weir and then passes over a rectangualr weir of 1 m width. If the discharge coefficients are 0.6 and 0.7 for triangular and rectangular weirs respectively, determine the head over the rectangular weir. Take head over the triangular weir as 36 cm. 12

Module – IV

VIII. a) Derive an equation for loss of head due to sudden expansion of flow in a pipe line. 8

b) A pipe of 50 mm diameter is 6 m long and the velocity of flow of water in the pipe is 2.4 m/sec. What loss of head and corresponding power would be saved if the central 2 m length of pipe was replaced by 75 mm diameter pipe, the change of section being sudden ? Take f = 0.04 for the pipes of both diameters. 12

OR

IX. a) Write a short note on pipes in series and pipes in parallel. 8

b) Briefly explain the following.

i) Reynold's experiment 6

ii) Laminar flow between two stationary parallel plates. 6