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SF-6443

B. E. - II (Sem. IV) (Civil) Examination

May / June – 2011

Fluid Mechanics - II

(Old Syllabus)

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 2 (Sem. 4) (Civil)**

Name of the Subject :

☛ **Fluid Mechanics - II (Old)**

☛ Subject Code No. : **6 4 4 3** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Figure to right indicate full marks.

(3) Assume missing data and state it clearly.

SECTION - I

1 (a) (1) Give the objectives of dimensional analysis. **6**

(2) Give the objectives of model testing.

(3) Give examples of dimensionally non-homogeneous equation and dimensionally homogeneous equation and explain their existance.

(b) Define boundary layer. Explain the phenomenon of separation due to the boundry layer formation and adverse pressure gradient. How such separation can be controlled by acceleration of the fluid in the boundry layer on suction of fluid from the boundary layer. Draw sketches to support your answers. **7**

(c) (i) List all variables that influence the motion of moving body fully submerged in a fluid and by dimensional analysis derive an expression for resistance of its motion. **7**

(ii) List the forces that influence the motion of a partially submerged object moving in fluid.

2 (a) Develop an expression for shear stress in turbulent flow as given by Bossinesq. Explain how it is of limited use. 7

(b) Starting from Prandtl'e mixing length theory obtain the expression $V = \frac{V_*}{K} + \log_e y + C$ for point velocity for turbulent flow is pipes.

OR

(b) Show that Reynolds number is a ratio of inertia to viscous forces. State under the predominance of which forces Euler number, Weber Number and Froude Number will be used. State the mathematical expression for the three. 8

3 Write short notes on any **three** of the following : 15

(i) Factor's affecting boundry layer thickness

(ii) Establishment of fully developed turbulent flow in pipes

(iii) Draw sketch of Moody's diagram to explain variation of friction factor.

(iv) Salient features of model of rivers.

SECTION - II

4 (a) A pelton wheel has a mean bucket speed of 12 m/s and is supplied with water at a rate of 750 litres per seconds under a head of 35 m. If the bucket deflects the jet through an angle of 160°, find the power developed by the turbine and its hydraulic efficiency. Take the coefficient of velocity as 0.98. Neglect friction in the bucket. Also determine the overall efficiency of the turbine if its mechanical efficiency is 80%. 10

(b) Derive expression for loss of energy due to sudden enlargement. 5

(c) Explain hydraulic gradient line and total energy line. 5

5 (a) A jet of water 75 mm diameter having a velocity of 20 m/s strikes normally a flat smooth plate. Determine the thrust on the plate if **10**

(i) Plate is at rest

(ii) Plate is moving in the same direction as the jet with a velocity of 5 m/s.

Also find the work done per second on the plate in each case and the efficiency of the jet when the plate is moving.

(b) Find the loss of head when pipe of diameter 400 mm and suddenly enlarged to diameter of 800 mm. The rate of flow of water through pipe is 250 litres/ seconds. **4**

OR

5 (a) Explain draft tube with its functions. **6**

(b) A pipe 50 mm diameter is 7 m long and velocity of flow of water in pipe is 2.0 m/s. Compute head loss and amount of corresponding power saved if the central 2.0 m length of pipe is 70 mm diameter pipe, the change of section being sudden. Take $f = 0.04$ for both pipe diameter. **8**

6 Write short notes on following : (any **four**) **16**

(i) Loss of head due to obstruction in pipe

(ii) Parts of pelton turbine

(iii) Force exerted by jet on flat plate which is stationary and normal to the jet.

(iv) Classification of turbines

(v) Loss of energy due to sudden contraction.