Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No. .....

CE–503(O)

B. E. (Fifth Semester) EXAMINATION, Nov./Dec., 2009

(Old Scheme)

(Civil Engg. Branch)

FLUID MECHANICS – II

[CE – 503(O)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Total *five* questions are to be answered, choosing *one* question from each Unit. Assume data if missing.

Unit – I

1. (a) Briefly explain the following : 10

(i) Boundary Layer Theory

(ii) Aging of Pipe

(b) What is Prandtl mixing length theory ? Explain clearly. 10

Or

2. (a) Derive an expression for loss due to sudden enlargement of a pipe flow. 10

(b) A pipe 6 cm in diameter, 1200 m long and having friction factor ($f = 0{\cdot}018$) is connected in parallel between two points A and B with another pipe 10 cm

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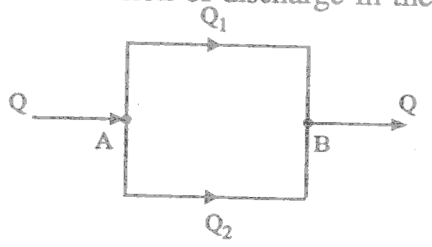
diameter, 1000 m long and having ($f = 0{\cdot}020$). A total discharge of 20 lit/sec. enters the parallel pipes through division at A to rejoin at B as shown in figure. Estimate the division of discharge in the two pipes. 10



Unit–II

3. (a) A rough timber flume ($n = 0{\cdot}012$) in the form of an equilateral triangle (apex down) of 1·2 m sides is laid on slope of 0·01. Calculate the uniform flow rate which occurs at a depth of 90 cm. 10

(b) What are the differences between pipe flow and open flow ? Explain clearly. 10

Or

4. A trapezoidal channel with side slopes of 1 : 1 has to be designed to convey 10 m^3/s at a velocity of 2 m/s, so that the amount of concrete lining for the bed and sides is the minimum. Calculate : 20

(i) The area of lining required for one metre length of the channel

(ii) Bed slope of the canal for uniform flow if rugosity coefficient (n) = 0·015.

Unit–III

5. (a) Show that for critical flow, the Froude no. is unit. 10

(b) For a hydraulic jump in a rectangular channel the velocity and depth after the jump are known to be

0·80 m/s and 1·75 m respectively. Calculate the depth before the jump, the energy loss and the power dissipated per metre width. 10

Or

6. (a) Explain the following terms : 10

(i) Specific energy of flow in open channel

(ii) Conjugate depth of flow in open channel

(iii) Broad crested weir

(iv) Hydraulic Bore

(b) A broad crested weir spanning the full width at a 2·0 m wide channel is 1·5 m high and has a square entrance. What head is required to pass a discharge of $3 \cdot 0\ m^3/s$? 10

Unit – IV

7. (a) Distinguish between the friction drag, pressure drag and profile drag. 10

(b) A car has a frontal projected area of $1 \cdot 6\ m^2$ and travels at 60 km/h. It has a drag coefficient of 0·35 based on frontal area. 10

(i) Calculate the power required to overcome wind resistance by the car.

(ii) If the drag coefficient is reduced to 0·30 by streamlining, for the same power expended in overcoming air resistance, what speed of the car is possible ? (Assume $\rho_{air} = 1 \cdot 2\ kg/m^3$).

Or

8. (a) What is Magnus effect ? Explain clearly. 10

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(b) A kite 0·8 m × 0·8 m weighing 4 N assumes an angle of 12° to the horizontal. The string attached to the kite makes an angle of 45° to the horizontal. The pull on the string is 25 N when the wind is blowing at a speed of 30 km/h. Find the coefficient of lift and drag. [Assume $\rho_a = 1{\cdot}2$ kg/m^3]. 10

Unit – V

9. (a) Briefly explain the following : 10

(i) Turbomachine

(ii) Cavitation phenomenon in turbine

(iii) Specific speed at a turbine

(iv) Draft tube

(b) A Pelton wheel, 2·45 m in diameter, operates under the following conditions : 10

Net head = 370 m

Coefficient of velocity (C_v) = 0·98

Speed ratio (ϕ) = 0·47

Angle of deflection (β) = 160

Diameter of jet = 18 cm

Determine :

(i) the input power to the shaft

(ii) the r. p. m. of the wheel

Or

10. (a) Draw a velocity triangle of a centrifugal pump. Also explain priming of a centrifugal pump. 10

(b) Briefly explain the following : 10

(i) Working principle of reciprocating pump

(ii) Single acting and double acting reciprocating pump