

4E4113	Roll No. _____	Total No. of Pages : <span style="border: 1px solid black; padding: 2px;">4</span>
	4E4113	
	B. Tech. IV-Sem. (Main & Back) Exam; April-May 2017	
	Civil Engineering	
4CE3A : Hydraulics & Hydraulic Machines		
Time : 3 Hours		
Maximum Marks : 80		
Min. Passing Marks : 26		

**Instructions to Candidates :-**

*Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

**UNIT - I**

- 1 Water flowing under an obstacle is shown in Fig.1 below. The flow exerts a vertical force on an object, which is assumed to be function of flow rate, density of water, acceleration of gravity and the length of object. A 1/20 scale model is to be used to predict the vertical force on the prototype.
- Use Banckingham  $\pi$  theorem to obtain  $\pi$  terms.
  - If the model force is 100 N, predict the corresponding force in prototype.

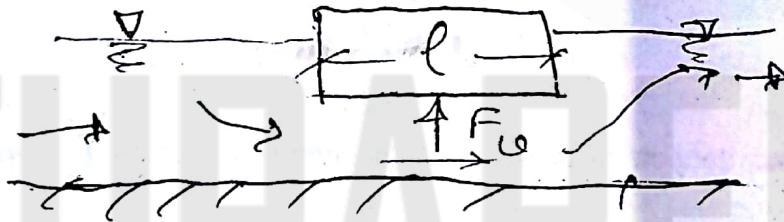


Fig. 1

OR

16

- 1 (a) What is law of dimensional homogeneity ? 3
- (b) Oil of kinematic viscosity  $4.65 \times 10^{-5} \text{ m}^2/\text{s}$  is to be used in a prototype in which both viscous and gravity forces dominate. A model scale of 1:5 is also desired. What viscosity of model liquid is necessary to make both Froude No. and Reynold No. the same in model and prototype ? 13

UNIT - II

- 2 (a) Derive the equation for velocity distribution in a circular pipe. 6
- (b) An oil of viscosity 9 poise and specific gravity 0.8 is flowing through a horizontal pipe of 50 mm diameter. If the pressure drop in 100 m length of pipe is  $1600 \text{ kN/m}^2$ ; determine
- (a) Rate of flow of oil
- (b) Centre line velocity. 10

OR

- 2 (a) Briefly describe different theories of turbulence. 10
- (b) Derive equation for velocity distribution for turbulent flow in pipes. 6

UNIT - III

- 3 (a) What do you mean by most economical section for open channel ? 3
- (b) Derive conditions for most economical trapezoidal channel section. 13

OR

4E4113 ]

2

[ P.T.O.

- 3 (a) What are assumptions taken to derive equation for gradually varied flow in open channel ?

6

- (b) Find the slope of the free water surface in a rectangular channel of width 20 m. having depth of flow 5m. The discharge through the channel is  $60 \text{ m}^3/\text{s}$ . The bed of channel is having slope of 1 in 4000. Take value of Chezy's const.  $C = 60$ .

10

UNIT - IV

- 4 (a) What are uses of hydraulic jump ?

6

- (b) A 4m wide rectangular channel conveys  $15 \text{ m}^3/\text{s}$  of water with a velocity of 5 m/s. Check is there a condition for hydraulic jump to occur. If the hydraulic jump takes place in down stream side, find the depth of flow after the jump.

10

OR

- 4 With neat sketches draw the velocity triangle at inlet and outlet of an unsymmetrical moving curved plate when jet strikes tangentially at one of its end. Define all terms used in triangles.

16

4E4113 ]

3

[ P.T.O.

UNIT - V

- 5 The power plant installation is shown in Fig. 2 below. Water passes through turbine and goes downstream. Determine power available to the turbine when the flow rate is  $30 \text{ m}^3/\text{s}$ .

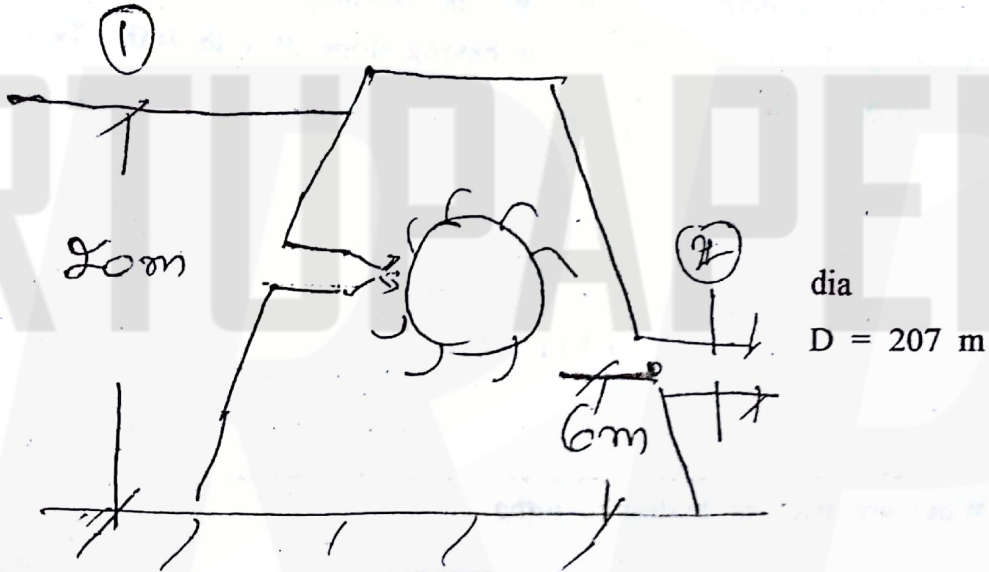


Fig. 2

16

OR

- 5 Give with neat sketches detailed classification of turbines.

16