

- d) Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water.

OR

Determine the efficiency of a Kaplan turbine developing 3000 kW under a net head of 5m. It is provided with a draft tube with its inlet (diameter 3m) set 1.6 m above the tail race level. A vacuum gage connected to draft tube indicates a reading of 5m of water. Assume draft tube efficiency as 80%.

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Roll No .....

**CE - 503**

**B.E. V Semester**

Examination, June 2015

**Fluid Mechanics - II**

**Time : Three Hours**

**Maximum Marks : 70**

- Note:* i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.  
 ii) All parts of each questions are to be attempted at one place.  
 iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.  
 iv) Except numericals, Derivation, Design and Drawing etc.

1. a) Define physical and mathematically the concept of displacement thickness of a boundary layer.
- b) Explain hydrodynamically smooth and rough pipe.
- c) What is Prandtl mixing length theory? Explain clearly.
- d) A horizontal pipe line 50 m long is connected to a water tank at one end and discharging freely into the atmosphere at other end. For the first 30 m of its length from the tank. The pipe is 15 cm dia and then its diameter is suddenly enlarged to 30 cm. The height of water level in the tank is 8.0 m above the centre of pipe. Considering all losses of head which occurs determine the rate of flow. Take  $f = 0.01$  for both the sections.

[2]

OR

A pipeline of diameter 0.3 m carries oil at the rate of 540 l/s. If the specific gravity of the oil is 0.80 and its kinematic viscosity is 0.023 stokes, determine the maximum permissible height of the protrusions upto which the pipe acts as smooth pipe.

2. a) Define "Normal" and "Critical Slopes".
- b) State the Chezy's formula for uniform flow through a channel. What is the dimension of constant 'c' in Chezy's formula?
- c) What is specific energy curve? Show its component parts in the curve.
- d) A Trapezoidal channel is to carry 8 m<sup>3</sup>/sec. of discharge at a velocity of 1.5 m/sec. Design the most economical section if the channel has side slopes 1 vertical to 2 horizontal.

OR

A 3m wide rectangular channel conveys 15 m<sup>3</sup>/sec. of water at a depth of 2m; Calculate :

- i) Specific energy and conjugate depth
  - ii) Critical depth, critical velocity and minimum specific energy
  - iii) Froude number and comment on the nature of flow.
3. a) Distinguish between the alternate depth and conjugate depth.
  - b) What is meant by gradually varied flow? On what assumptions are these flows analysed?
  - c) What is Venturi flumes? Explain the working of Venturi

[3]

- d) Water flows at the rate of 1.0 m<sup>3</sup>/sec. along a rectangular section of 1.6 m in width. Calculate the critical depth. If a standing wave occurs at a point where the upstream depth is 0.25 m, what would be the rise in water level produced and the H.P. loss in standing wave?

OR

Determine the length of the back water curve caused by an afflux of 2.2 m in a rectangular channel of width 40m and depth 2.50 m. The slope of the bed is 1:12000. Take Manning's N = 0.03.

4. a) Define total Drag and Lift.
- b) Differentiate between stream lined body and bluff body.
- c) What is an aerofoil? On what factors does the total drag on an aerofoil depends?
- d) Prove that the value of  $C_D$  for sphere for Reynold's

Number less than 0.2 is given by  $C_D = \frac{24}{Re}$

OR

Electrical transmission towers are stationed at 0.4 km intervals and a conducting cable 1.25 cm in diameter is stretched between them. If a wind of 110km/hr blows transversely across the wire, compute the total drag force on such wire between two towers. The drag coefficient for Reynold's number greater than 10<sup>4</sup> may be taken as 1.20.

5. a) Define specific speed and runaway speed of a turbine.
- b) What are unit quantities? Define the unit quantities for a turbine. Why are they important?
- c) What is priming? Why is it necessary?