

[4]

- d) Classify various types of turbine according to various head with suitable examples.

OR

A Turbine operating under a head of 32m develops a 8000 kW at a speed of 150 rpm. Determine the speed and power developed by the turbine when the head on the turbine is reduced to 8m.

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Total No. of Questions : 5]

[Total No. of Printed Pages : 4

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**CE-503**

**B.E. V Semester**

Examination, December 2016

**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 question 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.  
v) Assume any missing data, if required.

**Unit-I**

1. a) Define boundary Layer concept.  
b) List out major and minor losses during the flow of liquid through a pipeline.  
c) Deduce an expression for losses due to sudden expansion of pipe when flow of liquid flowing through a pipeline.  
d) A Compound pipeline consists of two pieces of identical pipes. The equivalent length of same diameter and same friction factor, for the compound Pipeline is  $L_1$  when pipes are connected in series and is  $L_2$  when pipes are connected in parallel. What is the ratio of equivalent lengths  $L_1/L_2$ .

OR

A Pipeline of diameter is 30cm and length 1000m carrying water at the rate of 50 liters/s. At a certain location A of a pipeline the pressure is 150 kN/m<sup>2</sup>. Find the pressure at section B which is 8m higher than A. Take Darcy's friction factor  $f = 0.01$

**Unit-II**

- 2. a) Define Froude number and Reynold's number.
- b) What do you understand by most economical trapezoidal channel section?
- c) Deduce an expression for the condition of most economical circular channel section of open channel flow.
- d) Water is flowing through a circular channel of diameter is 1m with a bed slope of 1 in 1000. Determine the maximum discharge through the channel. Assume Chezy's coefficient  $C = 60$ .

OR

Determine the efficient section of a trapezoidal channel designed to carry  $5\text{m}^3/\text{s}$  of water. The side slopes of the channel are 1(H) : 2(V) and the bed slope of the channel is 1 in 3000. Assume Manning's coefficient  $n = 0.03$ .

**Unit-III**

- 3. a) Show the Specific energy curve and also explain Critical flow.
- b) Define Hydraulic radius and Hydraulic depth.
- c) Differentiate Gradually Varied Flow (GVF) flow to a Rapid Varied Flow (RVF).
- d) A Hydraulic jump takes place in a rectangular channel with initial and sequent depths of 0.4m and 3.2m, respectively, Determine the discharge per meter width, the possible critical depth for this discharge and the energy loss in the jump.

OR

Show that the loss of energy head in a hydraulic jump is

$$\text{given by } h_f = \frac{(y_2 - y_1)^3}{4y_1 y_2}$$

Where  $y_1$  and  $y_2$  are sequent depths.

**Unit-IV**

- 4. a) Explain the reason of feeling resistance by an object when flowing in a fluid media. Explain.
- b) What do you mean by the term "Terminal Velocity" of a body?
- c) What is Magnus effect? Explain clearly.
- d) A Truck having a projected area of 12 square meter travelling at 60 km/hr has a total resistance of 1943 N. Of this 25% to rolling friction and 15% is due to surface fraction. The rest is due to form drag. Calculate the coefficient of form drag if the density of air is  $1.25 \text{ kg/m}^3$ ?

OR

A Kite in the form of a rectangular airfoil with a chord length of 80cm and a width of 45cm and weights 0.9 N. It is maintained at an angle of 20 degree to the horizontal and the string makes an angle of 30 degree to the vertical. If the wind speed is 14 km/hr (horizontal flow) and  $C_D$  is 0.25. Estimate the tension in the string and the coefficient for lift. Take density for air is  $1.25 \text{ kg/m}^3$ .

**Unit-V**

- 5. a) What do you understand by the term "Cavitation"? Also shows the importance of this term.
- b) Define Specific Speed of the Turbine. Also explain Runway Speed of the turbine.
- c) Define :
  - i) Draft Tube
  - ii) Velocity triangles of Pelton wheel turbine.