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Roll No ....

CE-221

B.E., III Semester

Examination, December 2016

Choice Based Credit System (CBCS)

Fluid Mechanics

Time : Three Hours

Maximum Marks : 60

Note: i)   Attempt any five questions.
ii) All questions carry equal marks.

1. a) Deduce the equation of the total hydrostatic force and the location of the centre of pressure on one side of an inclined plane area submerged within a liquid.
   b) Explain with neat sketches the conditions of equilibrium for floating and submerged bodies.

2. a) Define stream function and velocity potential. Show that the line of constant stream function and velocity potential must intersect orthogonally.
   b) A 45° reducing pipe-bend in a horizontal plane has an inlet diameter of 30cm and outlet diameter of 15cm. The pressure at the outlet is 20kPa gauge and rate of flow of water through the bend is 0.09m³/sec. Neglecting friction, determine the magnitude and direction of force required to keep the bend in position. Neglect the weight of the water in the bend.

3. a) Derive an expression for head loss due to sudden enlargement of a pipe.

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   b) Show that the energy transmitted by a long pipe is maximum when 1/3rd of energy put into the pipe is lost in friction.

4. a) Derive Chezy's equation for steady uniform flow through an open channel. Also state the Bazin's formula and manning's formula for determining the constant 'C'.
   b) What is specific energy curve? Draw specific energy curve depicting different regimes of flow.

5. a) What do you mean by gradually varied flow? What is the fundamental difference between gradually varied flow and rapidly varied flow?
   b) A trapezoidal channel having the side slope of 2 horizontal to 3 vertical carries water at 0.40m³/sec. if the bed slope of the channel is 1:2000, determine the optimum dimensions of the channel. Take Chezy's constant 'C' = 60

6. a) Differentiate between the form drag and the surface drag. What measures are to be taken to reduce the form drag on bodies? What are the factors that influence the total drag on body.
   b) Explain the Magnus effect and also describe an aerofoil.

7. a) With the help of neat diagram explain the construction and working of a Pelton wheel.
   b) What is run away speed for a hydraulic turbine? Find out a situation when it occurs? How it is helpful in design of rotating components of turbine.

8. a) What is a Draft tube? Why it is used in a reaction turbine? Describe with sketches two different types of draft tube.
   b) Define specific speed of a turbine. Derive an expression for the specific speed of a hydraulic turbine. What is the significance of the specific speed?

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