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Name: ....

Reg.No. ....

FIFTH SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2010

CE 04 506 - OPEN CHANNEL HYDRAULICS AND HYDRAULIC MACHINERY (2004 ADMISSIONS)

Time: 3 Hours | Maximum: 100 Marks

Answer all questions

1. (a) What is Chezy's formula? How is it derived?
   (b) What are the instruments used to measure velocity of flow in channel ? Explain briefly
   (c) What are the various applications of hydraulic jump?
   (d) Write a note on velocity triangle for a Francis turbine
   (e) Explain the terms (i) Specific energy . (ii) Critical depth in case of open channel flow
   (f) Derive the relation between water surface slope and channel bottom slope
   (g) A horizontal rectangular channel 4 m wide carries a discharge of 16 m^3/S, Determine whether a jump may occur at an initial depth of 0.5 m or not. If a jump occurs, determine the sequent depth, to this initial depth. Also determine the energy loss in the jump
   (h) A jet of water is issued from a nozzle at a velocity of 45 m/sec from a point, 10 m from a vertical wall, whose top is at a height of 12 m above the nozzle. Find the angle of projection to the horizontal to enable the jet just to clear the top of the wall.

$(8 \times 5 = 40)$

2. (a) (i) Analyse the transitions of decreasing channel cross-section with the help of specific energy and discharge diagrams.
   (ii) Explain briefly about Parshall flume.

OR

   (b) An earthen channel with a base width 2 m. and side slope 1 horizontal to 2 vertical carries water with a depth of 1 m. The bed slope is 1 in 625. Calculate the discharge if n =0.03. Also calculate the average shear stress at the channel boundary.

3. (a) (i) Explain the term hydraulic jump. Derive an expression for the depth of hydraulic jump in terms of upstream Froude number.
   (ii) A rectangular channel 6 m. wide carries water at 11.5 cumec at a depth of 0.3 m. Is a jump possible ? If so, find the depth after jump.

OR

   (b) A trapezoidal channel having bottom width 8 m. and side slope 1 : 1 carries a discharge of 80 m^3/s. Find the depth conjugate to initial depth of 0.75 m- before the jump. Also determine the loss of energy in the jump.

4. (a) A rectangular channel 5.4 m wide and 1.2 m deep has a side slope of 1 in 1000 and is lined with good rubble masonry for which Manning's n =0.017. It is desired to increase the discharge to a maximum by changing the channel slope or the form of section.
   The dimensions of the section may be changed but the channel must contain the same amount of lining. Compute the new dimensions and probable increase in discharge

OR

   (b) (i) For a constant specific energy of 1.8 Nm/N. Calculate the maximum discharge that may occur in a rectangular channel 5.0 m wide
   (ii) In a wide rectangular channel if the normal depth is increased by 20%, determine the corresponding percentage increase in the discharge. Use Manning's equation.

5. (a) (i) Explain the general principle of working of submergible
   (ii) Under what circumstance we can go for submersible pump ?
   (iii) How will you classify turbines?

OR

   (b) A hydraulic turbine, working under a head of 22 m develops 7360 kw running at 120 r.p.m. Calculate the changes in its normal speed and output if the head on the turbine is reduced to 20 m. $(4 \times 15 = 60)$