Code No: NR310101 **NR**

III B.Tech I Semester Supplementary Examinations, May 2005
HYDRAULICS AND HYDRAULIC MACHINERY
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Prove that for a channel of circular section the depth of flow d = 0.95 D for maximum discharge where d = depth of flow and D = diameter of circular channel.
   (b) The cross-section of an open channel consists of semi-circular bottom 1.20 m in diameter and with vertical sides. If the depth of water is 1.20 m and the bed slope is 1 in 2500, calculate the discharge. Take Chezy's C as 65.

2. (a) Fluid flows with out friction over a horizontal bed with velocity V and depth d such that $\overline{V} > \sqrt{gd}$. To what height must the channel bottom be raised to make the flow just critical?
   (b) A rectangular channel is reduced gradually from 2 m to 1.5 m and the floor is raised by 25cm at a given section. When the approaching depth of flow is 1.5 m, what rate of flow will be indicated, if the flow at the contracted section is at critical depth?

3. Water flows at a steady and uniform depth of 2 m in an open channel of rectangular cross - section having base width equal to 5 m and laid at a slope of 1 in 100. It is desired to obtain critical flow in the channel by providing a hump in the bed. Calculate hump height and sketch the flow profile. Consider the value of Mannings rugosity coefficient n = 0.02 for the channel surface.

4. In a 1 in 20 model of a stilling basin, the height of the hydraulic jump in the model is observed to be 0.20 metre. What is the height of the hydraulic jump in the prototype? If the energy dissipated in the model is $\frac{1}{10}$ h.p., what is the corresponding value in prototype?

5. A jet of water having a velocity of 60m/sec is deflected by a vane moving at 25m/sec in a direction at 30^0 to the direction of jet. The water leaves the vane normally to the motion of the vane. Draw the inlet and outlet velocity triangles and find out the vane angles for no shock at entry and exit. Take the relative velocity at the exit as 0.8 times the relative velocity at the entrance.

6. Obtain an expression to the work done per second by water on the runner of a Pelton wheel. Hence derive an expression for maximum efficiency of the Pelton wheel giving the relationship between the jet speed and the bucket speed.

7. (a) What do you understand by unit speed of a turbine? What is its use? Derive the equation for specific speed.
   (b) What are the constant efficiency curves of a turbine? What are their uses?

8. (a) How are large pumps primed ?
   (b) What are the different devices that are employed to convert high velocity into high pressure? Sketch and explain the answer.
   (c) How does the specific speed help the choice of a correct pump for a given duty?

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