Code No: R05220104 **R05** **Set No. 2**

II B.Tech II Semester Examinations,April/May 2012
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) Explain the transition with raised bottom in a rectangular channel.
   (b) A uniform flow of $12m^3/s$ occurs in a long rectangular channel of 5m width and depth of flow of 1.50m. A flat hump is to be built at a certain section. Assuming a loss of head equal to the upstream velocity head, compute minimum height of the hump to provide a critical flow. [8+8]

2. (a) How will you obtain an expression for the minimum speed for starting a centrifugal pump.
   (b) A centrifugal pump with 1.2m diameter runs at 200 rpm and pumps 880 litres per second, the average lift being 6m. The angle which the vanes make at exit with the tangent to the impeller is 26^0 and the radial velocity of flow is 2.5 m/s. Determine the manometric efficiency and the least speed to start pumping against a head of 6m, the inner diameter of the impeller being 0.6m. [8+8]

3. (a) What do you mean by most economical section of a channe? What are the conditions for the rectangular channel of the best section?
   (b) Determine the dimensions of the most economical trapezoidal earth-lined channel (Manning-s n = 0.02) to carry 14 m^3/s at a slope of 4 in 10,000.[8+8]

4. By dimensional analysis obtain an expression for the drag force R on a partially submerged body moving with a relative velocity V in a fluid; the other variables being the linear dimension l , height of surface roughness K, fluid density ρ, and the gravitational acceleration g. [16]

5. (a) Draw the inlet and outlet velocity triangles in the case of a Pelton wheel and explain with usual notations.
   (b) A Pelton wheel working under a head of 250m develops 120BHP at a speed of 250 rpm. If the overall efficiency is 82% and Coefficient of velocity is 0.975, find the jet diameter, the diameter of the bucket circle, the size of the buckets and the number of buckets required. Assume maximum efficiency condition that the peripheral velocity is 0.46times the velocity of the jet. [6+10]

6. A jet of water 15 mm diameter impinges on a series of cureed vanes exactly at their center and is deflected by 170^0. The velocity of the jet is 12 m/sec and the velocity of the vane is 6m /sec. It the vanes are arranged on the periphery of a wheel such that there is at least are one cureed vane always taking the jet of all times, estimate the power developed and the efficiency of the wheel? [16]

7. (a) A hydraulic turbine develops 120 KW under a head of 10 m at a speed of 90 rpm and gives an efficiency of 92%. Find the water consumption and the specific speed. If a model of scale 1: 30 is constructed to operate under a head of 8m what must be its speed, power and water consumption to run under the conditions similar to prototype.

   (b) What are the constant head characteristic curves of a turbine? What is the use to develop them? [10+6]

8. (a) What is meant by flow duration curve and power duration curve? How do you differentiate these? How would you construct such curves?

   (b) Why hour to hour or day to day fluctuations occur in supply or demand to the turbine? [8+8]

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Code No: R05220104 **R05** **Set No. 4**

II B.Tech II Semester Examinations,April/May 2012
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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   (b) What are the constant head characteristic curves of a turbine? What is the use to develop them? [10+6]

2. (a) Explain the transition with raised bottom in a rectangular channel.
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3. A jet of water 15 mm diameter impinges on a series of cureed vanes exactly at their center and is deflected by 170^0. The velocity of the jet is 12 m/sec and the velocity of the vane is 6m /sec. It the vanes are arranged on the periphery of a wheel such that there is at least are one cureed vane always taking the jet of all times, estimate the power developed and the efficiency of the wheel? [16]

4. (a) What is meant by flow duration curve and power duration curve? How do you differentiate these? How would you construct such curves?
   (b) Why hour to hour or day to day fluctuations occur in supply or demand to the turbine? [8+8]

5. (a) What do you mean by most economical section of a channe? What are the conditions for the rectangular channel of the best section?
   (b) Determine the dimensions of the most economical trapezoidal earth-lined channel (Manning-s n = 0.02) to carry 14 m^3/s at a slope of 4 in 10,000.[8+8]

6. (a) Draw the inlet and outlet velocity triangles in the case of a Pelton wheel and explain with usual notations.
   (b) A Pelton wheel working under a head of 250m develops 120BHP at a speed of 250 rpm. If the overall efficiency is 82% and Coefficient of velocity is 0.975, find the jet diameter, the diameter of the bucket circle, the size of the buckets and the number of buckets required. Assume maximum efficiency condition that the peripheral velocity is 0.46times the velocity of the jet. [6+10]

7. By dimensional analysis obtain an expression for the drag force R on a partially submerged body moving with a relative velocity V in a fluid; the other variables being the linear dimension l , height of surface roughness K, fluid density ρ, and the gravitational acceleration g. [16]

8. (a) How will you obtain an expression for the minimum speed for starting a centrifugal pump.

   (b) A centrifugal pump with 1.2m diameter runs at 200 rpm and pumps 880 litres per second, the average lift being 6m. The angle which the vanes make at exit with the tangent to the impeller is 26^0 and the radial velocity of flow is 2.5 m/s. Determine the manometric efficiency and the least speed to start pumping against a head of 6m, the inner diameter of the impeller being 0.6m. [8+8]

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Code No: R05220104 **R05** **Set No. 1**

II B.Tech II Semester Examinations,April/May 2012
HYDRAULICS AND HYDRAULIC MACHINERY
Civil Engineering

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

Answer any FIVE Questions
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   (b) A uniform flow of $12m^3/s$ occurs in a long rectangular channel of 5m width and depth of flow of 1.50m. A flat hump is to be built at a certain section. Assuming a loss of head equal to the upstream velocity head, compute minimum height of the hump to provide a critical flow. [8+8]

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Code No: R05220104 **R05** **Set No. 3**

II B.Tech II Semester Examinations,April/May 2012
HYDRAULICS AND HYDRAULIC MACHINERY
Civil Engineering

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

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