Code No: 07A40103 **R07** **Set No. 2**

II B.Tech II Semester Examinations,APRIL 2011
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. Write short notes on the following:
   (a) Firm Power
   (b) Secondary power
   (c) Diversity factor
   (d) Load duration curve. [16]

2. (a) What is meant by priming of a centrifugal pump? What are the different priming arrangements employed for small and big pumping units?
   (b) A centrifugal pump works against a head of 30 m and discharges 0.25 m^3/s while running at 1000 rpm. The velocity of flow at the outlet is 3 m/s and the vane angle at outlet is 30^0. Determine the diameter and width of impeller at outlet if the hydraulic efficiency is 80 per cent. [8+8]

3. (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]

4. (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]

5. (a) Give complete classification of the different types of open channel flow.
   (b) Water flows uniformly at a depth of 1.2 meters in a rectangular canal 3 metres wide laid on a slope of 1 metre per 1000 metres. What is the mean shear stress on the sides and bottom of the canal? Based on the Reynolds and Froude numbers, determine the type of flow in the canal. Take Chezy C as 70 and v = $10^{-6}m^2$/S. [8+8]

6. 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. [16]

7. A Kaplan turbine develops 1471kW under a head of 6m. The turbine is set 2.5m above the tailrace level. A vacuum gauge inserted at the turbine outlet records a suction head of 3.1m. If the hydraulic efficiency is 85%, what would be the efficiency of draft tube having inlet diameter of 3m. What will be the reading of suction gauge if power developed is reduced to half the head and speed remaining constant? [16]

8. (a) Explain the terms geometrical, kinematic and dynamic similarities.
   (b) Give the uses of Buckingham's pi theorem. [8+8]

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Code No: 07A40103 **R07** **Set No. 4**

II B.Tech II Semester Examinations,APRIL 2011
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 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. [16]

2. (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]

3. (a) What is meant by priming of a centrifugal pump? What are the different priming arrangements employed for small and big pumping units?
   (b) A centrifugal pump works against a head of 30 m and discharges 0.25 m^3/s while running at 1000 rpm. The velocity of flow at the outlet is 3 m/s and the vane angle at outlet is 30^0. Determine the diameter and width of impeller at outlet if the hydraulic efficiency is 80 per cent. [8+8]

4. (a) Explain the terms geometrical, kinematic and dynamic similarities.
   (b) Give the uses of Buckingham's pi theorem. [8+8]

5. (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]

6. Write short notes on the following:
   (a) Firm Power
   (b) Secondary power
   (c) Diversity factor
   (d) Load duration curve. [16]

7. A Kaplan turbine develops 1471kW under a head of 6m. The turbine is set 2.5m above the tailrace level. A vacuum gauge inserted at the turbine outlet records a suction head of 3.1m. If the hydraulic efficiency is 85%, what would be the efficiency of draft tube having inlet diameter of 3m. What will be the reading of suction gauge if power developed is reduced to half the head and speed remaining constant? [16]

8. (a) Give complete classification of the different types of open channel flow.

   (b) Water flows uniformly at a depth of 1.2 meters in a rectangular canal 3 metres wide laid on a slope of 1 metre per 1000 metres. What is the mean shear stress on the sides and bottom of the canal? Based on the Reynolds and Froude numbers, determine the type of flow in the canal. Take Chezy C as 70 and v = $10^{-6}m^2$/S. [8+8]

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Code No: 07A40103 **R07** **Set No. 1**

II B.Tech II Semester Examinations,APRIL 2011
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) What is meant by priming of a centrifugal pump? What are the different priming arrangements employed for small and big pumping units?
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2. (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]

3. (a) Give complete classification of the different types of open channel flow.
   (b) Water flows uniformly at a depth of 1.2 meters in a rectangular canal 3 metres wide laid on a slope of 1 metre per 1000 metres. What is the mean shear stress on the sides and bottom of the canal? Based on the Reynolds and Froude numbers, determine the type of flow in the canal. Take Chezy C as 70 and v = $10^{-6}m^2$/S. [8+8]

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5. (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]

6. (a) Explain the terms geometrical, kinematic and dynamic similarities.
   (b) Give the uses of Buckingham's pi theorem. [8+8]

7. Write short notes on the following:

(a) Firm Power

(b) Secondary power

(c) Diversity factor

(d) Load duration curve. [16]

8. A Kaplan turbine develops 1471kW under a head of 6m. The turbine is set 2.5m above the tailrace level. A vacuum gauge inserted at the turbine outlet records a suction head of 3.1m. If the hydraulic efficiency is 85%, what would be the efficiency of draft tube having inlet diameter of 3m. What will be the reading of suction gauge if power developed is reduced to half the head and speed remaining constant? [16]

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Code No: 07A40103 **R07** **Set No. 3**

II B.Tech II Semester Examinations,APRIL 2011
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) Give complete classification of the different types of open channel flow.
   (b) Water flows uniformly at a depth of 1.2 meters in a rectangular canal 3 metres wide laid on a slope of 1 metre per 1000 metres. What is the mean shear stress on the sides and bottom of the canal? Based on the Reynolds and Froude numbers, determine the type of flow in the canal. Take Chezy C as 70 and v = $10^{-6}m^2$/S. [8+8]

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3. Write short notes on the following:
   (a) Firm Power
   (b) Secondary power
   (c) Diversity factor
   (d) Load duration curve. [16]

4. (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]

5. (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]

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8. A Kaplan turbine develops 1471kW under a head of 6m. The turbine is set 2.5m above the tailrace level. A vacuum gauge inserted at the turbine outlet records a suction head of 3.1m. If the hydraulic efficiency is 85%, what would be the efficiency of draft tube having inlet diameter of 3m. What will be the reading of suction gauge if power developed is reduced to half the head and speed remaining constant? [16]

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