Code No: RR220103 **RR** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
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 Kaplan turbine develops 60,000 kw of power under a head of 25m with an overall efficiency of 90%. Taking the value of flow ratio ψ =0.5, speed ratio $\Phi = 1.6$, the hub diameter as 0.35 times the diameter of the runner, find [16]
   (a) The diameter of the runner
   (b) The speed of the turbine
   (c) The specific speed of the turbine
2. (a) Tests were conducted on a Francis turbine of 0.8m diameter under a head of 9m. The turbine developed 115 KW running at 240 rpm and consuming 1.2 m^3/sec. If the same turbine is operated under a head of 16m predict its new speed, discharge and power. [10]
   (b) What are the requirements of a governor in hydropower Installation? [6]
3. (a) How do you estimate the loss of energy in hydraulic jump?
   (b) A rectangular channel 6 m wide discharges 11200 lit/s of water into a 6 m wide apron with no slope with a mean depth velocity of 6 m/s. What is the height of the jump?. How much energy is absorbed in the jump? [8+8]
4. (a) Derive the condition for depth of flow of a most economical circular channel section subject to the condition for maximum velocity.
   (b) Water flows in a channel of the shape of isosceles triangle of bed width 'a'and sides making an. angle of 45^0 with the bed. Determine the relation between depth of flow d., and the bed width 'a' for maximum velocity and for maximum discharge condition. Use Manning's formula and note that d is less than 0.5a [8+8]
5. (a) Describe the multistage pump with
      i. impellers in series and
      ii. impellers in parallel
   (b) A centrifugal pump has an impeller of 80 cm in diameter and it delivers 1 m^3/s against a head of 80 m. The impeller runs at 1000 rpm and the width at outlet is 8 cm. If the leakage loss is 3% of the discharge, external mechanical loss is 10 KW and the hydraulic efficiency is 80%, calculate the blade angle at outlet, the power required, and the overall efficiency of the pump. [8+8]
6. (a) Derive expressions for critical depth, critical velocity. Also derive condition for minimum specific energy in terms of critical depth. [8+8]

(b) The discharge of water through a rectangular channel of width 6 m is 18 m^3/S when depth of flow of water is 2 m.
Calculate:

i. specific energy of the flowing water.

ii. critical depth and critical velocity and

iii. value of minimum specific energy.

7. 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? [16]

8. (a) Define the term: impact of jets. Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.

(b) Find the force exerted by a jet of water of diameter 100mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 30m/sec. [8+8]

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Code No: RR220103 **RR** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
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) Find the force exerted by a jet of water of diameter 100mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 30m/sec. [8+8]

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   (b) What are the requirements of a governor in hydropower Installation? [6]

4. (a) Derive expressions for critical depth, critical velocity. Also derive condition for minimum specific energy in terms of critical depth. [8+8]
   (b) The discharge of water through a rectangular channel of width 6 m is 18 m^3/S when depth of flow of water is 2 m.
   Calculate:
      i. specific energy of the flowing water.
      ii. critical depth and critical velocity and
      iii. value of minimum specific energy.

5. (a) Derive the condition for depth of flow of a most economical circular channel section subject to the condition for maximum velocity.
   (b) Water flows in a channel of the shape of isosceles triangle of bed width 'a'and sides making an. angle of 45^0 with the bed. Determine the relation between depth of flow d., and the bed width 'a' for maximum velocity and for maximum discharge condition. Use Manning's formula and note that d is less than 0.5a [8+8]

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(a) The diameter of the runner

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   i. impellers in series and

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   (b) A centrifugal pump has an impeller of 80 cm in diameter and it delivers 1 m^3/s against a head of 80 m. The impeller runs at 1000 rpm and the width at outlet is 8 cm. If the leakage loss is 3% of the discharge, external mechanical loss is 10 KW and the hydraulic efficiency is 80%, calculate the blade angle at outlet, the power required, and the overall efficiency of the pump. [8+8]

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Code No: RR220103 **RR** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
HYDRAULICS AND HYDRAULIC MACHINERY
Civil Engineering

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

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Code No: RR220103 **RR** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
HYDRAULICS AND HYDRAULIC MACHINERY
Civil Engineering

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

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   (b) Water flows in a channel of the shape of isosceles triangle of bed width 'a'and sides making an. angle of 45^0 with the bed. Determine the relation between depth of flow d., and the bed width 'a' for maximum velocity and for maximum discharge condition. Use Manning's formula and note that d is less than 0.5a [8+8]

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