

Code No: R05220104

R05**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

- How are various surface profiles in gradually varied flow classified depending on the relative magnitude of actual depth (d), normal depth (d_o) and critical depth (d_c). [16]
- A partially submerged body is towed in water. Assuming that the resistance R to the motion depends on the density ρ , the length of the body l , the velocity of the body, v , the viscosity μ and the acceleration due to gravity g , show that the resistance is given by $R = \rho l^2 v^2 \phi \left(\frac{\mu}{\rho v l}, \frac{lg}{v^2} \right)$. [16]
- Following is the record of average yearly flow in a river for 15 years. If the available head is 15m, construct the flow-duration curve and power-duration curve for the river. [16]

Year	1956	1957	1958	1959	1960	1961	1962
Flow (cumec)	905	865	1050	1105	675	715	850

1963	1964	1965	1966	1967	1968	1969	1970
775	590	625	810	885	1025	1150	925

- Why centrifugal pumps are less efficient as compared to turbines?
 - A centrifugal pump has an impeller diameter 25 cms, outlet width 5 cms, 1100 rpm, working against a head of 11 m. Vane angle at outlet is 30° . Manometric efficiency = 90%. Calculate the discharge. [6+10]
- The buckets of a Pelton impulse turbine deflect the jet through a total angle of 165° and owing to surface friction the relative velocity of water leaving the bucket is 0.85 times that at entry. Draw the velocity vector diagram at entry and exit and find the ratio of bucket velocity to jet velocity in order that the water shall leave the buckets with out whirl. In such a turbine the available head at the nozzle is 160m, the coefficient of velocity for the nozzle is 0.97, the jet diameter 100mm and mean bucket diameter 1.2m. Using the conditions referred to above, determine
 - Best running speed in r p m,
 - Impulsive force of the buckets at this speed
 - Power developed by the buckets
 - Efficiency of buckets. [16]
- What is kinematic similarity? What is its significance?

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- (b) A turbine develops 1900 KW at 500 rpm under a net head of 22m. Its diameter is 2.5m. A model of 1:5 is tested under a head of 4m. Estimate the size, speed, discharge and power developed by the model. Assume an efficiency of 82%. [8+8]
7. Show that when a jet of water impinges on a series of curved vanes, the maximum efficiency is obtained when the vanes are semi-circular in cross-section. [16]
8. (a) Derive the conditions for the most economical triangular channel section.
- (b) A sewer pipe is laid on a slope of 1 in 3000 and is to carry $2.5 \text{ m}^3/\text{s}$ when the pipe flows full. What size pipe should be used if n in Manning formula is 0.015? [8+8]

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R05**Set No. 4**

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Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

1. A partially submerged body is towed in water. Assuming that the resistance R to the motion depends on the density ρ , the length of the body l , the velocity of the body, v , the viscosity μ and the acceleration due to gravity g , show that the resistance is given by $R = \rho l^2 v^2 \phi \left(\frac{\mu}{\rho v l}, \frac{lg}{v^2} \right)$. [16]
2. The buckets of a Pelton impulse turbine deflect the jet through a total angle of 165° and owing to surface friction the relative velocity of water leaving the bucket is 0.85 times that at entry. Draw the velocity vector diagram at entry and exit and find the ratio of bucket velocity to jet velocity in order that the water shall leave the buckets with out whirl. In such a turbine the available head at the nozzle is 160m, the coefficient of velocity for the nozzle is 0.97, the jet diameter 100mm and mean bucket diameter 1.2m. Using the conditions referred to above, determine
 - (a) Best running speed in r p m,
 - (b) Impulsive force of the buckets at this speed
 - (c) Power developed by the buckets
 - (d) Efficiency of buckets. [16]
3. Show that when a jet of water impinges on a series of curved vanes, the maximum efficiency is obtained when the vanes are semi-circular in cross-section. [16]
4. (a) What is kinematic similarity? What is its significance?
 (b) A turbine develops 1900 KW at 500 rpm under a net head of 22m. Its diameter is 2.5m. A model of 1:5 is tested under a head of 4m. Estimate the size, speed, discharge and power developed by the model. Assume an efficiency of 82%. [8+8]
5. (a) Derive the conditions for the most economical triangular channel section.
 (b) A sewer pipe is laid on a slope of 1 in 3000 and is to carry $2.5 \text{ m}^3/\text{s}$ when the pipe flows full. What size pipe should be used if n in Manning formula is 0.015? [8+8]
6. Following is the record of average yearly flow in a river for 15 years. If the available head is 15m, construct the flow-duration curve and power-duration curve for the river. [16]

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7. (a) Why centrifugal pumps are less efficient as compared to turbines?
 (b) A centrifugal pump has an impeller diameter 25 cms, outlet width 5 cms, 1100 rpm, working against a head of 11 m. Vane angle at outlet is 30° . Manometric efficiency = 90%. Calculate the discharge. [6+10]
8. How are various surface profiles in gradually varied flow classified depending on the relative magnitude of actual depth (d), normal depth (d_o) and critical depth (d_c). [16]

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R05**Set No. 1**

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- Why centrifugal pumps are less efficient as compared to turbines?
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- Derive the conditions for the most economical triangular channel section.
 - A sewer pipe is laid on a slope of 1 in 3000 and is to carry $2.5 \text{ m}^3/\text{s}$ when the pipe flows full. What size pipe should be used if n in Manning formula is 0.015? [8+8]
- Show that when a jet of water impinges on a series of curved vanes, the maximum efficiency is obtained when the vanes are semi-circular in cross-section. [16]
- The buckets of a Pelton impulse turbine deflect the jet through a total angle of 165° and owing to surface friction the relative velocity of water leaving the bucket is 0.85 times that at entry. Draw the velocity vector diagram at entry and exit and find the ratio of bucket velocity to jet velocity in order that the water shall leave the buckets with out whirl. In such a turbine the available head at the nozzle is 160m, the coefficient of velocity for the nozzle is 0.97, the jet diameter 100mm and mean bucket diameter 1.2m. Using the conditions referred to above, determine
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7. How are various surface profiles in gradually varied flow classified depending on the relative magnitude of actual depth (d), normal depth (d_o) and critical depth (d_c).
[16]
8. (a) What is kinematic similarity? What is its significance?
- (b) A turbine develops 1900 KW at 500 rpm under a net head of 22m. Its diameter is 2.5m. A model of 1:5 is tested under a head of 4m. Estimate the size, speed, discharge and power developed by the model. Assume an efficiency of 82%.
[8+8]

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R05**Set No. 3**

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Civil Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

- What is kinematic similarity? What is its significance?
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- A partially submerged body is towed in water. Assuming that the resistance R to the motion depends on the density ρ , the length of the body l , the velocity of the body, v , the viscosity μ and the acceleration due to gravity g , show that the resistance is given by $R = \rho l^2 v^2 \phi \left(\frac{\mu}{\rho v l}, \frac{lg}{v^2} \right)$. [16]
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 - A sewer pipe is laid on a slope of 1 in 3000 and is to carry $2.5 \text{ m}^3/\text{s}$ when the pipe flows full. What size pipe should be used if n in Manning formula is 0.015? [8+8]
- Show that when a jet of water impinges on a series of curved vanes, the maximum efficiency is obtained when the vanes are semi-circular in cross-section. [16]
- Following is the record of average yearly flow in a river for 15 years. If the available head is 15m, construct the flow-duration curve and power-duration curve for the river. [16]

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- How are various surface profiles in gradually varied flow classified depending on the relative magnitude of actual depth (d), normal depth (d_o) and critical depth (d_c). [16]

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8. The buckets of a Pelton impulse turbine deflect the jet through a total angle of 165° and owing to surface friction the relative velocity of water leaving the bucket is 0.85 times that at entry. Draw the velocity vector diagram at entry and exit and find the ratio of bucket velocity to jet velocity in order that the water shall leave the buckets with out whirl. In such a turbine the available head at the nozzle is 160m, the coefficient of velocity for the nozzle is 0.97, the jet diameter 100mm and mean bucket diameter 1.2m. Using the conditions referred to above, determine
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 - (d) Efficiency of buckets.

[16]

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