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Courses » Principle of Hydraulic Machines and System Design

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Unit 9 - Week 7 - Hydraulic Turbine: Impulse Turbine

Course outline

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Introductory Session

Week 1 - Principle of Operation of Hydraulic Machines

Week 2 - Radial and Axial Flow Pumps

Week 3 - Radial Flow Pump Operational Issues

Week 4 - Pump Design: Degrees of Reaction

Week 5 - Pump Characteristics and System Design

Week 6 - Positive Displacement Pump

Week 7 - Hydraulic

Assignment 07

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2018-09-26, 23:59 IST.**

1) Consider the following energies associated with a Pelton wheel in a hydroelectric power plant **1 point**

(1) Mechanical Energy (2) Kinetic Energy (3) Potential Energy

The correct sequence of energy conversion starting from the entry of the fluid is

- 1-2-3
- 3-2-1
- 2-3-1
- 2-1-3

No, the answer is incorrect.

Score: 0

Accepted Answers:

3-2-1

2) Which of the following hydraulic turbines are reaction turbine **1 point**

- Deriaz Turbine
- Francis Turbine
- Kaplan Turbine
- Propeller Turbine

No, the answer is incorrect.

Score: 0

Accepted Answers:

Deriaz Turbine

Francis Turbine

Kaplan Turbine

Propeller Turbine

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wheel

Impulse
Turbine: Pelton
wheel (Contd.)

Quiz :
Assignment 07

Solutions of
Assignment 07

Week 8 -
Hydraulic
Turbine:
Reaction Turbine

- (a) and (b) only
- (b) and (c) only
- (c) and (a) only
- All statements are correct

No, the answer is incorrect.

Score: 0

Accepted Answers:

(c) and (a) only

4) A Kaplan turbine is a

1 point

- Reaction turbine
- Axial flow turbine with adjustable runner blades
- Low head – High discharge turbine
- All of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

All of the above

5) The hydraulic efficiency (theoretical) of a Pelton wheel is minimum when the bucket velocity **1 point** is

- Zero
- Equal to jet velocity
- Half the jet velocity
- Either zero or equal to jet velocity

No, the answer is incorrect.

Score: 0

Accepted Answers:

Either zero or equal to jet velocity

6) A Pelton wheel working under the net head of 200 m and rotating at 180 rpm develops 500 kW power. The pitch circle diameter of the turbine is 2 m. The average force imparted by water to the turbine buckets is _____ Newton.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 26500,26600

1 point

7) A Pelton wheel works in a hydroelectric power plant under a head of 400 m. The frictional **1 point** head loss in the penstock is 23.6 m. The pitch circle diameter of the turbine is 3 m. To produce the maximum shaft power, the optimal rotational speed of the turbine is

(Consider coefficient of velocity, $c_v = 1$ and $g = 9.81 \text{ m/sec}^2$. Neglect any bearing friction loss, windage loss and nozzle loss)

- 137 rpm
- 274 rpm
- 548 rpm
- 1096 rpm

No, the answer is incorrect.

Score: 0

Accepted Answers:

274 rpm

8) In a hydroelectric power plant 10 identical turbines work in parallel under the net head of 250 m. The volume flow rate of water through each turbine is $700 \text{ m}^3/\text{min}$. The overall efficiency of each turbine is 96% and the generator efficiency is 94%. The mechanical energy losses (through the penstock and nozzle) are estimated to reduce the output by 3.6%. The net electric power production from the plant is _____ MW.

(consider density of water 1000 kg/m^3 and $g = 9.81 \text{ m/sec}^2$)

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 245,255

1 point

9) A Pelton wheel working under a net head of 180 m produces 3750 kW power. The turbine, **1 point** driven by two similar jets runs at 375 rpm and deflects the jet by an angle of 165° . The diameter of the wheel is 1.45 m. The bucket friction coefficient (i.e. the relative velocity coefficient at the bucket) is 0.9 and the coefficient of velocity is 1. If the mechanical and volumetric efficiency of the turbine are 90% and 100% respectively, the jet ratio of the turbine is

(consider density of water 1000 kg/m^3 and $g = 9.81 \text{ m/sec}^2$)

- 3
- 6
- 9
- 18

No, the answer is incorrect.

Score: 0

Accepted Answers:

9

10) To run a single jet Pelton wheel, water is supplied from the reservoir by a penstock of length 300 m and diameter 50 cm. Except the frictional loss, all other minor losses in the penstock are negligible. The friction factor in the penstock is 0.025. To obtain the maximum power output from the turbine, the nozzle exit diameter (i.e. the jet diameter) should be _____ cm.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 20,23

1 point

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