Week #5. INTRODUCTION TO TURBOMACHINES

Assignment 5

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-09-12, 23:59 IST.

Instructions:
1. For questions (1-8): fill in the blanks
2. For questions (9-13): select the most appropriate option.
3. Take density of water as 1000 kg/m^3 and acceleration due to gravity as 9.81 m/s^2.

Note: The numerical value marked in red colour is correct answer while the answers within the numerical range of value given in the blue colour are considered as correct answer.

A centrifugal pump is pumping water at the rate of 20 litres/second. Readings recorded from pressure gauge mounted at the two ends of the pump are 80 kPa and 250 kPa. The height difference between the two ends of the pump is 300 mm and the suction and pressure end pipes are 75 mm diameter. Assuming no losses in the pump, calculate

1) Specific work ..... (m^2/s^2)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 170,175

4 points

2) Power required to run the pump ..... (kW)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 3.3,3.5

4 points

Air at a flow rate of 4.70 m3/s is drawn into an axial fan of diameter 95.5 cm from atmosphere at pressure 101.325 kPa and temperature 290 K. The power supplied to the fan is 2.5 kW. The total-to-total efficiency of the fan is 0.8. Considering Cp=1005 J/kg-K and Cv = 718 J/kg-K for air, find

3) mass flow rate ..... (kg/s)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 5.64,5.8

4 points

4) Specific work ..... (m^2/s^2)

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5) Total-to-static efficiency …… (%)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 74,76

5 points

Prototype of a water turbine is designed to produce 30 MW running at a speed of 150 rpm under a head of 18 m. To evaluate its performance, a model is made to operate under a head of 4 m running at a speed of 600 rpm. The model was found to give an overall efficiency of 0.86. Find

6) Ratio of diameter of model to prototype is.....

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.11,0.13

4 points

7) Power produced by model …….(kW)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 43,44

4 points

8) Volume flow rate of prototype …… (m^3/s)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 196,197

4 points

A fan operating on air at 1750 rpm at a volume rate of 4.2 m3/s develops a head of 150 mm measured on a water filled U-tube manometer. It is required to build a larger, geometrically similar fan which delivers the same head at the same efficiency as the existing fan, but at a rotational speed of 1450 rpm. Assuming density of air as 1.2 kg/m3, calculate

9) Ratio of diameter of larger to smaller fan is *5 points*

- 1.2
- 1.5
- 1.7
- 2.0

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.2

10) Volume flow rate (in m^3/s) of larger fan is *5 points*

- 4.1
- 5.1
- 6.1
- 7.1

No, the answer is incorrect.
Score: 0

Accepted Answers:
6.1

11) 2 points

Geometric similarity is said to exist between the model and the prototype, if both of them

- have identical velocities
- are equal in size and shape
- are identical in shape, but differ only in size
- have identical forces

No, the answer is incorrect.
Score: 0

Accepted Answers:
are identical in shape, but differ only in size

12) 2 points

A pump is needed to operate at 3000 rpm with a head of 6 m and a discharge of 0.2 m^3/s. Det what sort of pump is required.

- Axial flow pump
- Radial flow pump
- Mixed flow pump
- Reciprocating pump.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Axial flow pump

13) Froude number can be expressed as 2 points

- $\rho VL/\mu$
- $V/\sqrt{(gL)}$
- $\rho V^2 L/\sigma$
- $\Delta p/(\rho V^2)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$V/\sqrt{(gL)}$

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