Week 10: Assignment 10

The due date for submitting this assignment has passed.

Due on 2021-10-06, 23:59 IST.

As per our records you have not submitted this assignment.

1) The pressure ratio of a steam turbine is usually *1 point*

- much lower than that of a gas turbine.
- much more than that of a gas turbine.
- equal to gas turbine.

No, the answer is incorrect.
Score: 0
Accepted Answers:
much more than that of a gas turbine.

2) Following statements are made for a simple impulse turbine, *1 point*

i. Pressure in the rotor remains unchanged.
ii. Convergent divergent nozzles are used to produce high speed jets.
iii. Absolute velocity decreases whereas the relative velocity increases in the rotor.
iv. High aerodynamic losses are observed

Which of the following combination of statements is correct?

- all the correct
- (i), (ii) and (iii)
- (i) and (iii)
- (ii), (iii) and (iv)
- (i), (ii) and (iv)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(i), (ii) and (iv)

3) Aerodynamic loss of a simple impulse steam turbine is high because of, *1 point*

i. High speed of rotation.
ii. High pressure dropsin the nozzle producing high speed jet.
iii. Controlling a simple impulse turbine is difficult.
iv. The high kinetic energy of the jet from the convergent-divergent nozzle.

Which of the following combination of statements is correct?

- all the correct
- (i), (ii) and (iv)
- (i) and (ii)
- (i), (ii) and (iii)
- (ii) and (iv)

No, the answer is incorrect.
Score: 0
Accepted Answers:
all the correct

4) The compounding of impulse axial steam turbine is being done to *1 point*

- to control the losses.
- to reduce the condenser pressure.
- to reduce the rotor speed.
- all the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
to reduce the rotor speed.

5) Which of the following statement is not valid for pressure compounding steam turbine? *1 point*

- It is called as Rateau turbine.
- Inlet velocity at each stage remains almost same.
- Larger blade height towards the lower pressure side.
- Less efficient method of compounding.
- Requires large number of stages.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Less efficient method of compounding.

6) If the enthalpy drop across the stator of a steam turbine stage is zero, then the degree of reaction would be *1 point*

- 0
- 0.5
- 1.0
- None in the list.

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.0

7) For over-expansion in a convergent-divergent nozzle, i.e., when the back pressure if more than the designed pressure, *1 point*

- A shock is expected inside the nozzle.
- A shock may appear outside the nozzle.
- Expansion fans and compression waves appear outside the nozzle.
- Flow would be isentropic inside the nozzle producing supersonic jet.

No, the answer is incorrect.
Score: 0
Accepted Answers:
A shock is expected inside the nozzle.

8) When degree of reaction lies in 0 to 1, then the work produced by the axial flow steam turbine under the action of *1 point*

- impulsive force.
- reaction force.
- both impulsive and reaction forces
- none in the list.

No, the answer is incorrect.
Score: 0
Accepted Answers:
both impulsive and reaction forces

9) Assume no friction losses, the maximum blade efficiency of the 50% reaction turbine is always greater than the impulse turbine by a factor *1 point*

- $\frac{2\cos^2\alpha_1}{1+\cos^2\alpha_1}$
- $\frac{2}{1+\cos^2\alpha_1}$
- $cos^2\alpha_1$
- None in the list.

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{2}{1+\cos^2\alpha_1}$

10) For a velocity compounded steam turbine with frictionless, symmetric blades and n numbers of rows of moving blades, the optimum blade speed ratio will be *1 point*

- $\frac{1}{2n}$ times of the optimum blade speed ratio of a simple impulse turbine.
- $\frac{1}{n}$ times of the optimum blade speed ratio of a simple impulse turbine.
- n times of the optimum blade speed ratio of a simple impulse turbine.
- $2n$ times of the optimum blade speed ratio of a simple impulse turbine.

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{n}$ *times of the optimum blade speed ratio of a simple impulse turbine.*

11) In an impulse steam turbine, steam exit from a nozzle with a velocity 250 m/s where the isentropic enthalpy drops from inlet to exit in a stage was 32 kJ/kg. The stage efficiency is 88%. Which of the following answer is correct for the diagram or blade efficiency? *2 points*

- 84.3-84.5%
- 85.0-85.3%
- 90.0-90.3%
- 95.2-95.5%

No, the answer is incorrect.
Score: 0
Accepted Answers:
90.0-90.3%

12) An impulse steam turbine having symmetrical blades of 35 degree and nozzle exit angle of 20 degree with respective to tangential direction. Which of the following answer is correct for the maximum diagram or blade efficiency? *1 point*

- 88.25-88.35%
- 85.5-85.55%
- 90.5-90.6%
- 91.1-91.2%

No, the answer is incorrect.
Score: 0
Accepted Answers:
88.25-88.35%

13) Determine the shape of nozzle if the steam expands isentropically from 10 bar, 573 K to 2 bar. *2 points*

- Convergent
- Convergent-divergent
- Divergent

No, the answer is incorrect.
Score: 0
Accepted Answers:
Convergent-divergent

14) Following the problem no. 13, the specific volume of steam at inlet is measured as 0.258 m^3/kg. The mass flow rate through the nozzle is 1.0 kg/s, while the specific volume at the throat is 0.413 m^3/kg. Determine the diameter at the throat in mm.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 30,32.5

3 points

15) In the pressure compounded impulse turbine, each stage consists of rows of nozzle and rings of rotating blades. The nozzle angle in the first stage is 21 degree and the blade exit angle is 32.5 degree with reference to the plane of rotation. The blade rotates at the mean speed 140 m/s and the steam leaves the nozzle at 350 m/s. Consider blade friction coefficient 0.82 and nozzles efficiency 0.88. Determine work done (kJ) in a stage per kg steam flow rate.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 46,51

2 points

16) Following the problem no. 15, determine the stage efficiency in percentage.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 67,70

2 points