Week 9: Assignment 9

The due date for submitting this assignment has passed.

Due on 2021-09-29, 23:59 IST.

As per our records you have not submitted this assignment.

1) The pitch line design is generally valid only for the high-pressure axial flow turbines with high hub-to-tip ratio. *1 point*

- True
- False

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

2) In an axial flow turbine, total temperature across the nozzle *1 point*

- increases.
- decreases.
- remain constant.

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

3) For an axial flow turbine with *R*=0.5, the ratio of relative velocities at the exit to the inlet of the rotor is always *1 point*

- equal to 1
- less than 1
- greater than 1

No, the answer is incorrect.
Score: 0
Accepted Answers:
greater than 1

4) Considering the pressure distribution around a turbine blade, the minimum pressure occurs at *1 point*

- leading edge
- trailing edge
- throat
- it can occur anywhere depends upon the flow conditions.

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

5) In an impulse turbine stage, velocity *1 point*

- remains constant in both stator and rotor
- increases in stator and decreases in rotor
- increases in stator and remains unchanged in rotor
- decrease in stator and remains unchanged in rotor

No, the answer is incorrect.
Score: 0
Accepted Answers:
increases in stator and decreases in rotor

6) A single stage axial turbine with *R*=0.5 is used to expand the air. The total temperature change in a stage is ΔT_0, while the blade speed, *U*. The inlet and exit absolute flow angles with respect to axial direction are α_1 and α_2 respectively, where ϕ is the flow coefficient. The stage loading factor $\psi\left(\frac{C_p \Delta T_0}{U^2}\right)$ becomes *1 point*

- $\psi = 2\,(\phi \tan \alpha_2 - 1)$
- $\psi = 2\phi\,(\tan \alpha_2 - 1)$
- $\psi = \frac{\phi}{2}(\tan \alpha_2 - 1)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\psi = 2\,(\phi \tan \alpha_2 - 1)$

7) In a 40% reaction axial turbine, the rotor rotates with a velocity 210 m/s where the flow leaves the rotor axially with a velocity 200 m/s. Assume constant axial flow velocity in the stage, calculate the inlet absolute flow angle for the rotor. *2 points*

- 49.0-50.0
- 50.0-51.0
- 51.0-52.0
- None of the list

No, the answer is incorrect.
Score: 0
Accepted Answers:
51.0-52.0

8) A single stage gas turbine operates at its design condition with an axial absolute flow at entry and exit from the stage.The absolute flow angle at the rotor inlet is 70 deg. At stage entry, the total pressure and temperature are 300 kPa and 1150 K respectively. The exhaust static pressure is 100 kPa, the total to static efficiency is 0.85 and mean blade speed is 450 m/s. Assuming constant axial velocity through the stage, $C_p = 1.148kJ/KgK$ and $\gamma = 1.33$, determine the work done in kJ/kg. *2 points*

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 266,273

9) Following the Q8, calculate the Mach number leaving the nozzle. *2 points*

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.98,1.08

10) Following Q8, calculate the axial velocity (m/s) at exit of the stage. *1 point*

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 214,222

11) Following Q8, calculate total to total efficiency. *2 points*

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.88,.94

12) A small axial flow gas turbine with equal stage inlet and outlet velocities has the following design data based on the mean diameter:

inlet stagnation temperature	1000 K
inlet stagnation pressure	300 kPa
axial velocity	290 m/s
blade speed	410 m/s
nozzle efflux angle	62.5 degree
stage exit angle	10 degree
mass flow rate	20 kg/s

Assuming constant axial velocity through the stage, $C_p = 1.148kJ/kg - K$ and $\gamma = 1.33$, evaluate the rotor blade exit angle in degree. *2 points*

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 57,59

13) Following Q12, calculate the degree of reaction of the gas turbine. *1 point*

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.32,0.45

14) Following Q12, calculate the blade loading coefficient of the gas turbine. *1 point*

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.1,1.8

15) Following Q12, calculate the power output in kW. *1 point*

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 4982,4992