Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

- Lecture 24: Axial Flow Compressor (Part-I)
- Lecture 25: Axial Flow Compressor (Part-II)
- Lecture 26: Axial Flow Compressor (Part-III)
- Lecture 27: Axial Flow Compressor (Part-IV)
- Quiz: Week 7: Assignment 7
- Feedback Form for Week 7
- Week 7 : Assignment 7-Solution

Week 8

Week 9

Week 10

Week 11

Week 12

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Week 7: Assignment 7

The due date for submitting this assignment has passed.

Due on 2021-09-15, 23:59 IST.

As per our records you have not submitted this assignment.

1) For an axial flow compressor, as the number of stages increases, then the work done factor *1 point*

- decreases and then remains almost constant.
- increases and then remains almost constant.
- decreases and then increases gradually.
- does not alter.

No, the answer is incorrect.
Score: 0
Accepted Answers:
decreases and then remains almost constant.

2) The isentropic efficiency for turbine and compressor are represented by η_t and η_c respectively. Now, with the increase of pressure ratio, *1 point*

- η_t decreases and η_c increases.
- η_t increases and η_c decreases.
- η_c and η_t both remain unchanged.
- η_t and η_c both decreases.
- η_t and η_c both increases.

No, the answer is incorrect.
Score: 0
Accepted Answers:
η_t increases and η_c decreases.

3) For an axial flow machine, the isentropic efficiency of the turbine is *1 point*

- equal to stage isentropic efficiency.
- less than the stage isentropic efficiency.
- greater than the stage isentropic efficiency.
- none of these.

No, the answer is incorrect.
Score: 0
Accepted Answers:
greater than the stage isentropic efficiency.

4) For a given inlet and exit condition, the polytropic efficiency of an axial flow compressor is given by *1 point*

- $\frac{ln(\frac{p_{02}}{p_{01}})^{\frac{\gamma-1}{\gamma}}}{ln\frac{T_{02}}{T_{01}}}$
- $\frac{ln(\frac{p_{02}}{p_{01}})^{\frac{\gamma}{\gamma-1}}}{ln\frac{T_{02}}{T_{01}}}$
- $\frac{ln(\frac{T_{02}}{T_{01}})^{\frac{\gamma-1}{\gamma}}}{ln\frac{p_{02}}{p_{01}}}$
- $\frac{ln(\frac{T_{02}}{T_{01}})^{\frac{\gamma}{\gamma-1}}}{ln\frac{p_{02}}{p_{01}}}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{ln(\frac{p_{02}}{p_{01}})^{\frac{\gamma-1}{\gamma}}}{ln\frac{T_{02}}{T_{01}}}$

5) For an axial flow compressor of degree of reaction 0.5, R_T is the overall pressure ratio whereas R_s be the stage pressure ratio, and N the number of stages then, *1 point*

- $R_T = R_s^N$
- $R_T \leq R_s^N$
- $R_T \neq R_s^N$
- none of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
$R_T \neq R_s^N$

6) If T_{01} and T_{02} are the inlet and exit temperature of a compressor having N number of stages, the stage temperature rise ΔT_0 given by *1 point*

- $\Delta T_0 \neq \frac{T_{02}-T_{01}}{N}$
- $\Delta T_0 \geq \frac{T_{02}-T_{01}}{N}$
- $\Delta T_0 \leq \frac{T_{02}-T_{01}}{N}$
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of these

7) If the pressure rise in the rotor of an axial flow compressor is the same as that of the stator, then the degree of reaction will be *1 point*

- 0.5
- 1
- 0
- 0.25

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.5

8) For 50% reaction axial flow compressor *1 point*

- $\alpha_1 = \beta_1; \alpha_2 = \beta_2$
- $\alpha_1 = \beta_2; \alpha_2 = \beta_1$
- $\alpha_1 \leq \beta_2; \alpha_2 \geq \beta_1$
- $\alpha_1 \leq \beta_1; \alpha_2 \geq \beta_2$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\alpha_1 = \beta_2; \alpha_2 = \beta_1$

9) At off-design, the stage efficiency is mainly affected by *1 point*

- profile loss
- tip clearance loss
- secondary loss
- none of these

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

10) Secondary flow loss occurs *1 point*

- due to the formation of the boundary layer on the blade surface
- due to the formation of the passage vortex
- due to tip leakage vortex
- none of these.

No, the answer is incorrect.
Score: 0
Accepted Answers:
due to the formation of the passage vortex

11) An axial flow compressor is used to compress the air from 1 bar to 4 bar, where the isentropic efficiency of the compressor is 0.85. Assume $\gamma = 1.4$. The polytropic efficiency of the compressor is *2 points*

- 0.780-0.825
- 0.825-0.855
- 0.855-0.890
- 0.890-0.950

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.855-0.890

12) An axial flow compressor used to compress the air has the following data, *2 points*
The total temperature at intel: 300K
The total temperature at exit: 1100K
The stage isentropic efficiency: 0.87
Temperature rise per stage is limited to 27K
Assume $\gamma = 1.4$
Calculate, number of stages (N) required.

- N = 27
- N = 28
- N = 29
- N = 30
- N = 31

No, the answer is incorrect.
Score: 0
Accepted Answers:
N = 30

13) Following problem 12, evaluate the overall pressure ratio R_T. *2 points*

- 51.5-52.0
- 52.0-52.5
- 52.5-53.0
- 53.0-53.5
- 53.5-54.0

No, the answer is incorrect.
Score: 0
Accepted Answers:
52.0-52.5