

Unit 10 - Week 8:

Course outline

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● Lecture 36: Basic Principles and Energy Transfer in Axial Flow Compressor Part - I

● Lecture 37: Basics Principles and Energy Transfer in Axial Flow Compressor Part - II

○ Lecture 38: Fans and Blowers Part - I

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Details Solution

Assignment 8

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

Due on 2019-10-23, 23:59 IST.

1) In an axial flow compressor, the condition to have a symmetrical blading is:

1 point

(Here, α_1 is the exit angle from stator, β_1 is the inlet angle to rotor, α_2 is the inlet angle to stator and β_2 is the outlet angle from rotor.)

- (a) $\alpha_1 = \alpha_2$ and $\beta_1 = \beta_2$
 (b) $\alpha_1 = \beta_1$ and $\alpha_2 = \beta_2$
 (c) $\alpha_1 = \beta_2$ and $\alpha_2 = \beta_1$
 (d) None of these.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

2) Within a stage of an axial flow compressor the mean blade peripheral velocity is 200 m/s, axial velocity of fluid is 180 m/s, the inlet angle to rotor is 43.9° and the outlet angle from rotor is 13.5° . Also it is known that the work-done factor is 0.86, the stage isentropic efficiency is 0.85 and inlet stagnation temperature is 288 K. The pressure ratio is:

1 point

(given: for air constant pressure specific heat, $c_p = 1.005 \text{ J/kgK}$, specific heat ratio $\gamma = 1.4$)

- (a) 1.25
 (b) 2.25
 (c) 3.25
 (d) 3.5

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

3) Consider the following statements in respect of axial flow air compressors:

1 point

- (i) The stationary blades convert the kinetic energy of the fluid into pressure energy.
 (ii) The stationary blades redirect the flow into an angle suitable for entry to the next row of moving blades.
 (iii) The axial velocity remains at a reasonably constant value throughout the length of the compressor despite the increase in density of air.

Which of the statements given above is/are correct?

- (a) (i) and (ii)
 (b) (i) and (iii)
 (c) (ii) and (iii)
 (d) (i), (ii) and (iii)

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

d

4) Air at a temperature of 300 K and pressure 100 kN/m^2 flows into an axial flow compressor. The mean diameter and peripheral speed are 0.5 m and 150 m/s respectively. Mass flow rate through the stage is 30 kg/s; the work done factor is 0.95 and mechanical efficiency is 90%. The inlet angle to rotor is 51° , the outlet angle from rotor is 10° , both the inlet angle to stator and the exit angle from stator are 8° . Assuming an isentropic stage efficiency of 85%, blade height at entry is (constant pressure specific heat for air is 1005 J/kgK , ratio of specific heats is 1.4)

1 point

- (a) 0.15 m
 (b) 0.45 m
 (c) 0.05 m
 (d) 0.75 m

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

5) In Q.4 the stage pressure ratio will be

1 point

- (a) 2.27
 (b) 3.37
 (c) 1.17
 (d) 4.17

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

6) In Q.4 the power required to drive the stage is

1 point

- (a) 1096 kW
 (b) 548 kW
 (c) 274 kW
 (d) 137 kW

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

7) The degree of reaction is a measure of

1 point

- (a) The ratio of static enthalpy rise in the rotor to that in the stator
 (b) The ratio of static enthalpy rise in the rotor to that in the whole stage
 (c) The ratio of static enthalpy rise in the stator to that in the rotor
 (d) The ratio of static enthalpy rise in the stator to that in the whole stage

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

8) The basic purpose of fans and blowers with that of the compressors differs in

1 point

- (a) Compressors decrease the static pressure of air while fans and blowers impart high kinetic energy to the same
 (b) Compressors increase the static pressure of air while fans and blowers impart high kinetic energy to the same
 (c) Compressors impart high kinetic energy to air while fans and blowers drastically increase the static pressure of the same
 (d) Compressors decrease the kinetic energy of air while fans and blowers impart high static pressure to the same

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

9) A centrifugal fan impeller may have backward swept blades, radial tipped blades or forward swept blades. Depending on their functionalities and purpose of use, which among the below statements is correct?

1 point

- (a) Forward swept blades are used for handling dust-laden air or gas while backward swept vanes are employed for lower pressure and lower flow rates.
 (b) Backward swept blades are used for handling dust-laden air or gas while forward swept vanes are employed for lower pressure and lower flow rates.
 (c) Radial tipped vanes are employed for handling dust-laden air or gas while forward-swept blades are used for high stage pressure rise.
 (d) Backward swept vanes are employed for handling dust-laden air or gas while radial tipped blades are used for high stage pressure rise.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

10) Consider a centrifugal fan with zero whirl velocity at the inlet. The specific work done by the impeller to the fluid can be expressed as

1 point

- (a) $U_2^2 \left(\frac{\tan(\beta_2)}{\tan(\alpha_2) + \tan(\beta_2)} \right)$
 (b) $U_2 \left(\frac{\tan(\beta_2)}{\tan(\alpha_2) + \tan(\beta_2)} \right)$
 (c) $U_2^2 \left(\frac{\tan(\alpha_2)}{\tan(\alpha_2) + \tan(\beta_2)} \right)$
 (d) $U_2^2 \left(\frac{\tan^2(\alpha_2)}{\tan(\alpha_2) + \tan(\beta_2)} \right)$

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a