Unit 14 - Week 11: Axial compressor: Theory, single stage and multi-stage compressor, cascades and losses

Assignment 11

Due on 2020-12-02, 23:59 IST

1) For a three-stage reaction axial compressor stage, following statements are given:
   i. Velocity triangle at the entry and exit of the rotor are symmetrical
   ii. The ratio of rotor speed to impeller speed of the axial compressor at the entry of rotor and entry of stator are same.

   Which of the following options are correct?
   - Both i and ii are correct
   - i is correct but ii is incorrect
   - i is incorrect but ii is correct
   - Both i and ii are incorrect

   No. the answer is incorrect
   Score: 0
   Accepted Answer:
   i. is correct but ii is incorrect

2) An axial compressor, which generates a stagnation pressure ratio of 4:1, operates with inlet and exit stagnation pressures of 300 K and 400 K, respectively. If the ratio of specific heats (z) is 1.4, the isentropic efficiency of the compressor is?

   - 0.94
   - 0.91
   - 0.92
   - 0.93

   No. the answer is incorrect
   Score: 0
   Accepted Answer:

3) An axial compressor rotor with 50% degree of reaction, operates with an axial velocity of 200 m/s. The absolute flow angle at the inlet of the rotor is 23°. The axial velocity is assumed to remain constant through the rotor, the magnitude of the relative velocity at the rotor exit is

   - 210.6
   - 230.3
   - 216.7
   - 246.8

   No. the answer is incorrect
   Score: 0
   Accepted Answer:

4) In a 50% reaction axial compressor stage, the blade to blade velocity is 306 m/s and the axial component of velocity is 100 m/s. If the absolute inlet flow angle of 45°, the work per unit mass done on the fluid by the stage is in kJ/kg is

   - 30
   - 49
   - 59
   - 69

   No. the answer is incorrect
   Score: 0
   Accepted Answer:

5) Consider two engines P and Q. In P, the high pressure turbines are cooled with a bleed of HP turbine compressor after the compression process and in Q, turbines blades are not cooled. Compressing engine P with engine Q, which one of the following is NOT TRUE?
   - Turbine inlet temperature is higher for engine P
   - Specific thrust is higher for engine P
   - Compressor work to be same for both P and Q
   - Fuel flow rate is lower for engine P

   No. the answer is incorrect
   Score: 0
   Accepted Answer:
   Fuel flow rate is lower for engine P

6) For a given inlet condition, if the turbine inlet temperature is fixed, what value of compressor efficiency gives the lowest amount of fuel added in the combustor of a gas turbine engine?

   - 1
   - 0.95
   - 0.98
   - 1

   No. the answer is incorrect
   Score: 0
   Accepted Answer:

7) A gas turbine engine is mounted on an aircraft which can attain a maximum altitude of 10 km above sea level. The combustor volume of this engine is designed based on conditions at

   - sea level
   - 5 km altitude
   - 6.5 km altitude
   - 11 km altitude

   No. the answer is incorrect
   Score: 0
   Accepted Answer:
   9 km altitude

8) For a single-stage subsonic compressor, which of the following statements about the highest possible compressor pressure ratio (CPR) is correct?
   - CPR of an axial compressor = CPR of centrifugal compressor
   - CPR of an axial compressor < CPR of centrifugal compressor
   - CPR of an axial compressor > CPR of centrifugal compressor
   - CPR of any value can be obtained with either an axial or a centrifugal compressor

   No. the answer is incorrect
   Score: 0
   Accepted Answer:
   CPR of an axial compressor > CPR of centrifugal compressor

9) The combustion products of a gas turbine engine can be assumed to be a calorically perfect gas with γ = 1.3. The pressure ratio across the turbine stage is

   6.5
   - The measured inlet and exit stagnation temperatures are 1200 K and 900 K, respectively. The turbine-total temperature efficiency is _______ % (round off to the nearest integer).
   - 0.93
   - 0.91
   - 0.81
   - 0.82

   No. the answer is incorrect
   Score: 0
   Accepted Answer:

10) The maximum gas flow rate can be handled by a multi-stage axial compressor at a given rotational speed is dictated by

   - Compressor surge
   - Blading Shale
   - Choking
   - Optimum design pressure ratio

   No. the answer is incorrect
   Score: 0
   Accepted Answer:

   Choking