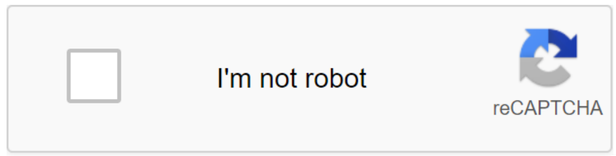

Continue

Centrifugal compressor nptel pdf

EXERCISES PROBLEMS AND SOLUTIONS FOR CYCLE, CENTRIFUGAL, AXIAL COMPRESSORS For all exercises, let's say R'287J/kg K and 1.4 for air 1. Determine the pressure factor developed and specific input work for the drive of a centrifugal air compressor with a diameter of 0.5 m and running at 7000 rpm. The input eye of the compressor impeller is 0.3 m in diameter. The axial speed at the entrance is 120 m/s and the mass flow speed is 10 kg/s. The speed in the delivery duct is 110 m/s. The speed of the impeller tip is 450 m/s and is 16,000 rpm with a total isentropic head efficiency of 80%. Temperature and pressure of logging stagnation and pressure and 300 K. Calculate (a) static temperature and pressure at the entrance and exit of the compressor, b) static pressure ratio, c) power required to drive the compressor. Ans. (T1 - 292.8 K, T2 - 476.45 K, p 93 kN/m 2 , p2 - 386.9 kN/m 2 , p2/p1 - 4.16, p - 1.83 MW) 3. The following results were obtained as a result of testing on a small one-way centrifugal compressor delivery compressor compressor stagnation pressure 2.97 bar delivery compressor stagnation temperature 429 K Static pressure at the tip of the impeller 1.92 bar Mass flow 0.60 kg/s rotational speed of 766 revs / with Ambient conditions 0.99 bar 288 K Determine the asanthropic compressor efficiency. The diameter of the impeller is 0.165 m, the downed depth of the unswerost diffuser is 0.01 m, and the number of impeller vans is 17. Using the Stanica equation for the sliding factor, calculate the stagnation pressure at the tip of the impeller. Ans. (0.76, 3.13 bar) 4. A one-way centrifugal compressor must deliver 14 kg/s of air when operating at a pressure ratio of 4:1 and a speed of 200 rpm. The sliding factor and power input ratio can be taken as much as 0.9 and 1.04 respectively. The total efficiency of isentropics is 0.80. Determine the total diameter of the impeller. Ans. (0.69m) PROBLEMS ON AXIAL COMPRESSORS 5. Each stage of the axis flow compressor has a 50% reaction degree and has the same average blade speed and the same value of the angle of the relative velocity of the socket. The average flow adequacy is constant for all stages at 0.5. When entering the first stage, the stagnation temperature is 290 K, the stagnation pressure is 101 kP. The static pressure is 87 kPa, and the flow area is . Determine the axis speed, mass flow speed and shaft power needed to produce a compressor when there are 6 stages and a mechanical efficiency of 0.98. 135.51 m/s, 56.20 kg/s, 10.68 MW) 6. The compressor stage of the axial flow has the root of the blade, medium and tips speeds of 150, 200 and 250 m/s Stage should Designed to increase the stagnation temperature of 20 K and an axial speed of 150 m/s, as a constant from tip. The work rate is 0.93. Assuming a reaction rate of 0.5 at an average radius, determine the air angles at the root medium and tip for a free vortex design where the vortex velocity component changes back with a radius of 7. The wasp compressor has the following data: Temperature and pressure at the entrance 300 K, 1.0 bar Reaction degree 50% Average diameter of the blade ring 0.4 m Rotational speed 15000 rpm The height of the blade when entering 0.08 m Air Angles on the rotor and stator output 25 Axial speed 150 m/s Work made factor 0.90 Isentropic efficiency stage 85% Mechanical efficiency 97% Determine (a) air angles on the rotor and stator input (b) air mass flow speed (c) power, necessary to get a compressor, (d) The pressure factor developed by the Mach (e) number (based on relative speeds) at the rotor entrance. Ans. (a) 25, 58.44 (b) 17.51 kg/s, (c) 0.89 MW, (d) 1.58, (e) 0.83 8 axial flow compressor scene has an average diameter of 0.6 m and runs at 15,000 rpm. Suppose the mechanical efficiency of 86% and the initial temperature of 35 degrees Celsius (b) of isentropic stage efficiency and (c) degree of reaction if the temperature at the exit of the rotor is 55 degrees Celsius. Ans. (a) 2 MW, (b) 94.2%, (c) 66.6% EXERCISE PROBLEMS AND SOLUTIONS FOR CYCLE, CENTRIFUGAL, AXIAL COMPRESSORS For all exercises, let's say R'287J/kg K and 1.4 for air 1. Determine the pressure factor developed and specific input work for the drive of a centrifugal air compressor with a diameter of 0.5 m and running at 7000 rpm. The input eye of the compressor impeller is 0.3 m in diameter. The axial speed at the entrance is 120 m/s and the mass flow speed is 10 kg/s. The speed in the delivery duct is 110 m/s. The speed of the impeller tip is 450 m/s and is 16,000 rpm with a total isentropic head efficiency of 80%. Temperature and pressure of logging stagnation and pressure and 300 K. Calculate (a) static temperature and pressure at the entrance and exit of the compressor, b) static pressure ratio, c) power required to drive the compressor. Ans. (T1 - 292.8 K, T2 - 476.45 K, p 93 kN/m 2 , p2 - 386.9 kN/m 2 , p2/p1 - 4.16, p - 1.83 MW) 3. The following results were obtained from a test on a small one-sided centrifugal compressor delivery compressor with a stagnant pressure of 2.97 bar delivery compressor stagnation temperature 429 K Static pressure at the tip of the impeller 1.92 bar Flow 0.60 kg/s rotational speed 766 revs / with Ambient terms 0.99 bar 288 K Determine asanthropic compressor efficiency. The diameter of the impeller is 0.165 m, m, diffuser is 0.01 m and the number of impeller vans is 17. Using the Stanica equation for the sliding factor, calculate the stagnation pressure at the tip of the impeller. Ans. (0.76, 3.13 bar) 4. A one-way centrifugal compressor must deliver 14 kg/s of air when operating at a pressure ratio of 4:1 and a speed of 200 rpm. The sliding factor and power input ratio can be taken as much as 0.9 and 1.04 respectively. The total efficiency of isentropics is 0.80. Determine the total diameter of the impeller. Ans. (0.69m) PROBLEMS ON AXIAL COMPRESSORS 5. Each stage of the axis flow compressor has a 50% reaction degree and has the same average blade speed and the same value of the angle of the relative velocity of the socket. The average flow adequacy is constant for all stages at 0.5. When entering the first stage, the stagnation temperature is 290 K, the stagnation pressure is 101 kP. The static pressure is 87 kPa, and the flow area is . Determine the axis speed, mass flow speed and shaft power needed to produce a compressor when there are 6 stages and a mechanical efficiency of 0.98. 135.51 m/s, 56.20 kg/s, 10.68 MW) 6. The compressor stage of the axis flow has a root, medium and tip of 150, 200 and 250 m/s. The stage should be designed to increase the stagnation temperature by 20 K and axal speed of 150 m/s, as permanent from root to tip. The work rate is 0.93. Assuming a reaction rate of 0.5 at an average radius, determine the air angles at the root medium and tip for a free vortex design where the vortex velocity component changes back with a radius of 7. The wasp compressor has the following data: Temperature and pressure at the entrance 300 K, 1.0 bar Reaction degree 50% Average diameter of the blade ring 0.4 m Rotational speed 15000 rpm The height of the blade when entering 0.08 m Air Angles on the rotor and stator output 25 Axial speed 150 m/s Work made factor 0.90 Isentropic efficiency stage 85% Mechanical efficiency 97% Determine (a) air angles on the rotor and stator input (b) air mass flow speed (c) power, necessary to get a compressor, (d) The pressure factor developed by the Mach (e) number (based on relative speeds) at the rotor entrance. Ans. (a) 25, 58.44 (b) 17.51 kg/s, (c) 0.89 MW, (d) 1.58, (e) 0.83 8 axial flow compressor scene has an average diameter of 0.6 m and runs at 15,000 rpm. Suppose the mechanical efficiency is 86% and the initial temperature is 35 degrees Celsius (b) of isentropic stage efficiency and (c) the degree of reaction if the temperature at the rotor output is 55 degrees Celsius Ans. (a) 2 MW, (b) 94.2%, (c) 66.6% Language for Video Transcript: English Bengali Gujarati Hindi Kannada Malayalam Marathi Marathi Marathi Marathi Telugu Show Transcript Sl.No Chapter Title MP4 Download 1Lecture 1: Definition of Liquid Machines and Energy Transfer in Liquid Machines Part - IDownload2Lecture 2: Transmission of Energy in Liquid Machines Part - IIDownload3Lecture 3: Impulse and Reaction Machines: Introductory ConceptsDown4Lecture 4: Principles of Similarity in Liquid MachineDown5Lecture 5: Specific Concept Principles of Similarity in Liquid MachineDownload5Lecture 5: Concept Specific SpeedDownload6Lecture 6: Basic Principles Of Power Analysis and Electricity Production Part - IDownload7Lecture 7 : Basic principles, Power And Power Generation Analysis Part - IIDownload8Lecture 8: Specific Speed Control and LimitIng Pulse TurbineDownload9Lecture 9: Textbook - IDownload10Lecture 10: Textbook - IIDownload11Lecture 11: Introduction and Force Analysis by Francis Turbine (Radial Stream) Part - IDown12Lecture 12: Power Part Analysis - II and Power GenerationDownload13Lecture 13: Metro Download14Lecture 14: Tutorial -IIIDownload15Lecture 15: Tutorial - IVDown16Lecture 16: Axial Flow TurbineDownLoad 17Lecture 17 : TurbineDown 18Lecture Reaction 18 : Introduction to Rotodynamic PumpsDownload19Lecture 19: Flow and transfer of energy to centrifugal pumpsDown20Lecture 20: Textbook - VDownload21Lecture 21: Characteristics of centrifugal pumpDownload222Lecture 22: Pump and system alignment23 diffuser and cavitloadationDownDown24Lecture 24: Textbook - VIDown25Lecture 25: Textbook - VIIIDownload26Lecture 26: Axial Flow PumpDownload27Lecture 27: Pump Response - IDownload28Lecture 28: Pump Response - IIDown29ure 29: Tutorial - VIIIDownload30Lecture 30 : Basic Principles and Transfer of Energy to the Centro-Key Compressor - IDown31ure 31 : Basic Principles and Transfer of Energy in the Centrifugal Compressor - IIDownload32Lecture 32: Basic Principles and Transfer of Energy in the Centrifugal Compressor - IIIDownload33Lecture 33: The Basic Principle of Energy Transfer to centrifugal compressor - IV and loss in centrifugal compressorsDownDown Performance Performance of Centrifugal Compressors Part - IDownload35Lecture 35: Performance Characteristics of Centrifugal Compressors Part - IIDownload36Lecture 36 : Basic Principles and Energy Transfer in Axial Flow Compressor Part - IloadDown37Lecture 37 : Basic Principles and Transmission of Energy in Axial Flow Compressor - IIDownload38Lecture 38: Fans and Blowers Part - IDownload39Lecture 39: Fans and Blowers Part - IIDownload Sl.No Language Book Link 1EnglandEly Available2BengaliNot Available3GujaratiNot Affordable4HindiNe Available5KannadaNot Available6MalayalamNot Available7MarathiNot Available8TamilNot Available9TeluguNot Available Available Available available available centrifugal compressor nptel pdf. centrifugal compressor nptel videos. surging and choking in centrifugal compressor nptel. centrifugal air compressor nptel. centrifugal compressor working nptel