

Unit 8 - Week 6: Interaction of Shocks and Expansion Waves

Course outline

How does an NPTEL online course work?

Week 0: Prerequisite

Week 1: Review Concepts of Fluid Mechanics and Thermodynamics

Week 2: Wave Propagation in Compressible Medium

Week 3: Quasi-One Dimensional Isentropic Flow

Week 4: Normal Shock Waves

Week 5: Expansion Waves and Oblique Shocks

Week 6: Interaction of Shocks and Expansion Waves

Quiz : Assignment 6

Lec 17: Interaction of Shocks and Expansion Waves - I

Lec 18: Interaction of Shocks and Expansion Waves - II

Feedback form

Lecture Notes_week 6

Sample solution- assignment 6

Week 7: Compressible Flow with Friction and Heat Transfer

Week 8: Measurement Diagnostics and Experimental Facilities for Compressible Flow

Live Session

Text Transcripts

Practice Questions for Examination

Assignment 6

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

Due on 2020-10-28, 23:59 IST.

1) For an isentropic supersonic nozzle flow, the exit Mach number is fixed by its area ratio if desired pressure ratio is maintained. 2 points

- (A) TRUE
 (B) FALSE

No, the answer is incorrect.

Score: 0

Accepted Answers:

(A) TRUE

2) Which of the following flow parameter is an important design features of diffuser incorporated in a supersonic wind tunnel? 2 points

- (A) Stagnation temperature loss
 (B) Static temperature loss
 (C) Stagnation pressure loss
 (D) Static pressure loss

No, the answer is incorrect.

Score: 0

Accepted Answers:

(C) Stagnation pressure loss

3) Subsonic flow in convergent-divergent nozzle has _____no of isentropic solutions. 2 points

- (A) only one
 (B) infinite
 (C) only two
 (D) either one or two

No, the answer is incorrect.

Score: 0

Accepted Answers:

(B) infinite

4) A supersonic wind tunnel operates at reservoir pressure of 1.8 atm with test section Mach number of 2.6. It incorporates a diffuser towards end of the tunnel for discharging air at a very low Mach number under atmospheric condition. If the stagnation pressure ratio corresponding to normal shock at Mach 2.6 is 0.4601, then the diffuser efficiency is _____.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 1.15,1.35

2 points

Air ($\gamma = 1.4$) is passing through a convergent-divergent duct with "throat to exit" area ratio as 0.5. The pressure at exit is 85 kPa and the reservoir pressure is 90 kPa. The following isentropic data may be used for area ratios, Mach number and pressure ratios. Use the given data to answer the following questions. (Q5 & Q6)

M	P_2/P_1	T_2/T_1	M_{a2}
3.0	10.33	2.679	0.4752
1.72	3.285	1.473	0.6355

5) The Mach number at the throat is _____.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 0.6,0.8

2 points

6) The Mach number at the exit is _____.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 0.26,0.3

2 points

Air ($\gamma = 1.4$) is flowing through a supersonic nozzle with a pitot tube mounted at the exit. The reservoir pressure and temperature are 10 atm and 500 K, respectively. The pressure measured by the pitot tube is 0.6172 atm and the throat area is 0.3 m². In isentropic flow condition for exit Mach number of 5, the area ratio (A/A^*) is 25. Using the given data, answer the following questions (Q7 to Q10).

7) The exit area (in 'm²') is _____.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Numeric) 7.5

2 points

8) The exit temperature (in 'K') is _____.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 83,102

2 points

9) The exit pressure (in 'atm') is _____.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 0.015,0.025

2 points

10)The mass flow rate (in 'kg/s') through the nozzle is _____.

Hint

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 548,550

2 points