Unit 9 - Week 7: Compressible Flow with Friction and Heat Transfer

Assignment 7

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

Due on 2020-11-04, 23:59 IST.

1) Heat is added to a subsonic flow in a one-dimensional duct in the upstream region of the flow. Which flow parameter increases in the downstream region of the duct? ***2 points***

- (A) Stagnation pressure
- (B) Static pressure
- (C) Mach number
- (D) All of the these

No, the answer is incorrect.
Score: 0
Accepted Answers:
(C) Mach number

2) The thermodynamic Mollier diagram for a heating and cooling processes for the compressible flow is represented by _____ curve. ***2 points***

- (A) Rayleigh
- (B) Fanno
- (C) Hugoniot
- (D) Prandtl-Meyer function

No, the answer is incorrect.
Score: 0
Accepted Answers:
(A) Rayleigh

3) What is the percentage change in total temperature of the flow in the downstream of a 2 m long constant area duct, with inlet Mach number of 3? ***2 points***

- (A) 2.1
- (B) 1
- (C) No change
- (D) 1.5

No, the answer is incorrect.
Score: 0
Accepted Answers:
(C) No change

4) In a diabatic, one dimensional steady flow with no work interaction when heat is added, then the total pressure in the downstream is _____than the total pressure in upstream. ***2 points***

- (A) equal
- (B) less
- (C) more
- (D) Depend on upstream Mach number

No, the answer is incorrect.
Score: 0
Accepted Answers:
(B) less

5) In a Rayleigh curve, it is possible to decelerate the supersonic flow to a subsonic value. ***2 points***

- (A) TRUE
- (B) FALSE

No, the answer is incorrect.
Score: 0
Accepted Answers:
(A) TRUE

6) At the point of maximum enthalpy in a p-v plane, the Rayleigh line and isentropic line have equal slope. ***2 points***

- (A) TRUE
- (B) FALSE

No, the answer is incorrect.
Score: 0
Accepted Answers:
(B) FALSE

7) In a Fanno curve, the increase in length of a constant area duct always causes decrease in pressure and specific enthalpy. ***2 points***

- (A) TRUE
- (B) FALSE

No, the answer is incorrect.
Score: 0
Accepted Answers:
(B) FALSE

8) In a Rayleigh curve, at fixed specific enthalpy drop, the increase in mass flux will lead to reduction in pressure drop. ***2 points***

- (A) TRUE
- (B) FALSE

No, the answer is incorrect.
Score: 0
Accepted Answers:
(B) FALSE

9)
Air ($\gamma = 1.4$ and Cp=1.005 kJ/kg-k) enters in a heated duct at Mach 2.0 with atmospheric pressure and 288 K. Calculate the amount of heat per unit mass (kJ/kg), required to choke the flow at the exit of the duct if the stagnation temperature at the downstream becomes 1.26 times the upstream value. Neglect the frictional effects.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 134.5,136.5

2 points

10) Air ($\gamma = 1.4$) enters through a 180 mm diameter pipe with inlet Mach number of 2.6 for which the non-dimensional parameter $\frac{4fL^*}{D} = 0.4526$. The average value of friction coefficient (f) is 0.005. The length of the duct (in 'm') required to choke the flow at the exit of the duct is _____.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 4,4.2

2 points