

Unit 6 - Week 4: Characteristic Parameters of Rocket Nozzle

Course outline

How to access the portal?

Week-0

Week 1: Introduction to Rocket Engines & Governing Equations

Week 2: Thermochemistry, Thrust Equation & Performance Parameters of Rocket Engine

Week 3: Nozzle Characteristics

Week 4: Characteristic Parameters of Rocket Nozzle

Lecture 16: Effect of Back Pressure & Thrust Coefficient

Lecture 17: Thrust Coefficient

Lecture 18: Characteristics Velocity, Combustion Efficiency & Thrust Effectiveness

Lecture 19: Actual Rocket Nozzle Characteristics

Lecture 20: Flight Performance of a Rocket Vehicle

Quiz : Week 4: Assignment

Week 4: Assignment Solution

Feedback For Week 4

Week 5: Flight Trajectory & Elements of Orbital Mechanics

Week 6: Types of Propellant & its Selection, Multi-staging of rocket and SRPE

Week 7: Solid, Liquid & Composite Propellant Rocket Engine, Burning and Flame Structure

Week 8: Solid Propellants: Characteristics & Regression Rate Relation

Week 9: Evolution of Burning surface, Ignition System of Solid Propellant Grains, Types of Liquid Propellant Rocket Engine and Injection System

Week 10: Liquid Propellant Rocket Engines: Injection system, Atomization, Combustion Process and Feed System

Week 11: Feed System, Ignition System, Combustion Instability & Cooling System in LPRE

Week 12: Hybrid Propellant Rocket Engine and Non-chemical Rocket Engine

Week 4: Assignment

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

Due on 2019-08-28, 23:59 IST.

1) Flow separation doesn't depend on the wall roughness and geometry of duct. Given statement is:

1 point

- True
 False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

2) Maximum thrust obtained when nozzle is over expanded. Given statement is:

1 point

- True
 False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

3) Characteristic velocity is dependent on chamber temperature and chamber pressure. Given statement is:

1 point

- True
 False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

4) An increase in flow divergence in C-D nozzle leads to lower the specific impulse. Given statement is:

1 point

- True
 False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

5) For a typical launch vehicle, aerodynamic drag losses are quite high as compared to the gravitational losses. Given statement is:

1 point

- True
 False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

6) A rocket engine produces 20kN thrust operating at chamber pressure of 3 MPa with throat diameter, 100 mm. The thrust coefficient of a rocket engine is:

1 point

- 0.98
 0.85
 0.74
 0.90

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.85

7) The maximum value of optimal thrust coefficient for a rocket engine if the exhaust gases are considered to be diatomic with $\gamma=1.4$

1 point

- 1.4
 1.6
 1.8
 1.9

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.8

8) The characteristic velocity of a choked nozzle with stagnation temperature of 1400 K: ($\gamma=1.3$, M.wt.=28 kg/kmol)

1 point

- 1296 m/s
 886 m/s
 1124 m/s
 966 m/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
966 m/s

9) A C-D nozzle is designed with semi divergence angle of 30° . The value of divergence correction factor for this nozzle is:

1 point

- 0.91
 0.93
 0.95
 0.97

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.93

10) A spacecraft is flying with equivalent exhaust velocity of 1800 m/s. The I_{sp} of the engine when the mass ratio, MR is 5:

1 point

- 295 s
 365 s
 200 s
 330 s

No, the answer is incorrect.
Score: 0

Accepted Answers:
295 s

11) The exhaust gas at stagnation pressure of 2 MPa and stagnation temperature of 1400 K enters into a C-D nozzle having throat area, 0.10 m^2 . Determine the total thrust produced by the isentropic choked nozzle when the exit and atmospheric pressure are estimated to be 30 kPa and 100 kPa respectively: (Consider, $\gamma=1.25$, M.wt.=28 kg/kmol)

2.5 points

- 1868 kN
 2074 kN
 2354 kN
 2587 kN

No, the answer is incorrect.
Score: 0

Accepted Answers:
2587 kN

12) A fully expanded rocket isentropic nozzle with throat area, 150 cm^2 is operating at Mach number 2 with fuel burn rate of 8 kg/s. The value of I_{sp} for the rocket engine is: (Consider, $\gamma=1.67$, M.wt.=4 kg/kmol & $P_{\text{atm}}=100 \text{ kPa}$)

2.5 points

- 193.8 s
 240.4 s
 274.8 s
 294.6 s

No, the answer is incorrect.
Score: 0

Accepted Answers:
193.8 s

13) Hot combustion gas at 2300 K and chamber pressure of 8 MPa is fully expanded in a C-D nozzle with throat area, 0.14 m^2 to ambient pressure at sea level. The estimated values of characteristics velocity and exit velocity are: (Consider, $\gamma=1.3$, M.wt.=30 kg/kmol & $P_{\text{atm}}=100 \text{ kPa}$)

0 points

- 1197 m/s & 1875 m/s
 1384 m/s & 2370 m/s
 1197 m/s & 1875 m/s
 1454 m/s & 2460 m/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
1197 m/s & 1875 m/s

14) The exhaust gas at 1600 K and 1 MPa enters into nozzle at a velocity of 600 m/s and leaves at exit pressure of 100 kPa. If the isentropic efficiency of the nozzle is 0.94 then the exit temperature would be: ((Consider, $\gamma=1.25$, $C_p=1005 \text{ J/kg.K}$)

2.5 points

- 1228 K
 1057 K
 1164 K
 1095 K

No, the answer is incorrect.
Score: 0

Accepted Answers:
1057 K