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Unit 3 - Week 1: Introduction to Rocket Engines & Governing Equations

Week 1: Assignment

The due date for submitting this assignment has passed. **Due on 2019-08-14, 23:59 IST.**
As per our records you have not submitted this assignment.

1) Turbojet is an example of *1 point*

- Air-breathing propulsive engine works on the principle of constant pressure
- Air-breathing propulsive engine works on the principle of constant volume
- Non-air-breathing propulsive engine works on the principle of constant pressure
- Non-air-breathing propulsive engine works on the principle of constant volume

No, the answer is incorrect.
Score: 0
Accepted Answers:
Air-breathing propulsive engine works on the principle of constant pressure

2) Which of the following statement is true in reference to the acceleration of rocket *1 point*

- Acceleration decreases with increase in exhaust velocity
- Acceleration increases with increase in fuel burn rate
- Rocket of mass doesn't affect the acceleration of the rocket
- None of the above mentioned

No, the answer is incorrect.
Score: 0
Accepted Answers:
Acceleration increases with increase in fuel burn rate

3) Identify the correct statement related to air breathing and rocket engine *1 point*

- Air-breathing engine cannot operate beyond Mach number 5 and rocket engine cannot operate beyond Mach number 10
- For air-breathing engine, rate of climb decreases with altitude whereas for rocket engine, it increases
- Flight speed is always greater than jet velocity for air breathing engine and rocket engine
- Air-breathing engine operates in both and atmosphere but rocket engine operates only in atmosphere

No, the answer is incorrect.
Score: 0
Accepted Answers:
For air-breathing engine, rate of climb decreases with altitude whereas for rocket engine, it increases

4) Consider the following statements regarding the specifications of GSLV and choose the correct one *1 point*

- N_2O_4/UDMH propellant system is used for 2nd Stage and strap-on boosters
- HTPB fuel is used for 3rd Stage
- 1^{st} Stage has the highest value of I_{sp} among all stages
- 2^{nd} Stage has the highest mass among all stages

No, the answer is incorrect.
Score: 0
Accepted Answers:
N_2O_4/UDMH propellant system is used for 2nd Stage and strap-on boosters

5) Nuclear rocket is an example of non-chemical rocket. This statement is: *1 point*

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

6) In rocket engine, viscous forces are negligibly small as compared to inertial or pressure forces in the region away from the combustor wall. This statement is ***1 point***

- True
- False

No, the answer is incorrect.
Score: 0
Accepted Answers:
True

7) Solid propellant rocket engine has higher specific impulse as compared to liquid and hybrid rocket engines. This statement is ***1 point***

- True
- False

No, the answer is incorrect.
Score: 0
Accepted Answers:
False

8) Thrust developed by the rocket engine is dependent of flight velocity. This statement is: ***1 point***

- True
- False

No, the answer is incorrect.
Score: 0
Accepted Answers:
False

9) Consider the problem statement given below to answer the following questions (Q.9-10) ***2 points***
Air at 1300 K and 1.2 atm with velocity of 660 m/s enters into an isentropic nozzle and leaves with the velocity of 1060 m/s
9. The temperature at the nozzle exit would be: (Cp=1005 J/kgK, specific gas constant=1.4)

- 957.7 K
- 1096.5 K
- 836.3 K
- 1136.6 K

No, the answer is incorrect.
Score: 0
Accepted Answers:
957.7 K

10) The pressure at the nozzle exit would be**:** ***1 point***

- 1.5 atm
- 2.1 atm
- 0.5 atm
- 0.4 atm

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.4 atm

11) Consider the following problem statement to answer the following questions (Q.11-13) ***2 points***
In a gas turbine power plant, turbine is used to run compressor and generate power. Air enters into the compressor at 85 kPa and 300 K at a rate of 12 kg/s and leaves at 1 MPa and 650 K whereas products from the combustor enters the turbine at a rate of 15 kg/s with total enthalpy of 4340 kJ/kg and leaves with total enthalpy of 3290 kJ/kg. (Cp_{in}=1005 J/kgK, Cp_{out}=1150 J/kgK)
11. The work done by the compressor

- -3.22 MJ/s
- -5.35 MJ/s
- 8.21 MJ/s
- 3.22 MJ/s

No, the answer is incorrect.
Score: 0
Accepted Answers:
-5.35 MJ/s

12) The work done by the turbine ***2 points***

- 23.74 MJ/s
- 10.53 MJ/s
- 15.75 MJ/s
- 27.94 MJ/s

No, the answer is incorrect.
Score: 0
Accepted Answers:
15.75 MJ/s

13) The net power delivered to the generator by the turbine **1 point**

- 20.51 MJ/s
- 10.39 MJ/s
- 15.42 MJ/s
- 8.22 MJ/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
10.39 MJ/s

14) In a rocket motor, liquid hydrogen and liquid oxygen enter into combustion chamber at a rate of 1.2 kg/s and 7 kg/s respectively. After combustion, the exhaust gas leaves the nozzle with diameter of 14 cm at 870 K and 1.2 atm. For this condition, the exit velocity of exhaust gases would be: (Assume the exhaust gases are perfect with M.wt of 28 kg/Kmol) **2 points**

- 564 m/s
- 896 m/s
- 1208 m/s
- 1400 m/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
1208 m/s