Unit 13 - Week 11: Feed System, Ignition System, Combustion Instability & Cooling System in LPRE

Week 11: Assignment

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

Due on 2019-10-16, 23:59 IST.

1) Gas generator turbo-pump feed system is not affected by the altitude. Given statement is: *1 point*

- True
- False

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

2) Selection of igniter does not depend on the type of propellant. It only depends on safety measures. Given statement is: *1 point*

- True
- False

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

3) Screaming/screeching is a kind of high frequency combustion instability in LPRE. Given statement is: *1 point*

- True
- False

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

4) A change in injection design alters the heat release in combustion chamber (CC) and hence controls the combustion instabilities. Given statement is: *1 point*

- True
- False

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

5) Film cooling is more efficient than the regenerative cooling. Given statement is: *1 point*

- True
- False

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

6) Which of the following material works like a heat sink at the throat of the nozzle: *1 point*

- Graphite
- Aluminum
- Silica phenolic
- Copper

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

7) Which of the following statement is true with respect to the ablative cooling: *1 point*

- It is not suitable for the boosters and upper-stage applications.
- It cannot be used in solid propellant rocket engines.
- It is limited to chamber pressure of 20 bars but can be used up to 70 bars when assisted by film cooling.
- Low strength material is used for the outer wall of nozzle.

No, the answer is incorrect.
Score: 0
Accepted Answers:
It is limited to chamber pressure of 20 bars but can be used up to 70 bars when assisted by film cooling.

8) The combustion instability caused due to coupling of combustion and feed line system is known as: *1 point*

- Screeching
- Chugging
- Buzzing
- Entropy waves

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

9) Identify the incorrect statement with respect to the controlling of combustion instabilities in LPRE: *1 point*

- The combustion instability is reduced by changing aerodynamics in CC.
- Chemical additives can augment droplet shattering and alter heat release to control pressure oscillation.
- Baffles minimizes the coupling between heat release rate and acoustic oscillation.
- By increasing the injection velocity, pressure oscillation can be minimized because spray occurs at longer distance to avoid pressure oscillation.

No, the answer is incorrect.
Score: 0
Accepted Answers:
By increasing the injection velocity, pressure oscillation can be minimized because spray occurs at longer distance to avoid pressure oscillation.

10) Triethylaluminum is a type of: *1 point*

- Catalytic igniter
- Hypergolic igniter
- Spark plug igniter
- Resonance igniter

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

11) Consider the following problem statement to answer questions from Q.11-15 *1 point*

A liquid-propellant rocket engine is designed to supply 10 kN of thrust with characteristic velocity and thrust coefficient of 1740 m/s and 1.2 respectively along with the mixture ratio of 2.8. The combustion chamber pressure and temperature are 6 MPa and 2800 K. The fuel with density of 1200 kg/m^3 is stored in the propellant tank at a pressure of 0.8 MPa and the oxidizer with density of 850 kg/m^3 is stored at 0.4 MPa. A single turbine with mechanical efficiency of 0.91 is used to drive oxidizer (η_{Ox} = 0.7) and fuel (η_F = 0.8) pumps.

The mass flow rate of fuel is:

- 1.26 kg/s
- 2.14 kg/s
- 2.88 kg/s
- 3.60 kg/s

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.26 kg/s

12) The mass flow rate of oxidizer is: *1 point*

- 1.44 kg/s
- 2.18 kg/s
- 2.86 kg/s
- 3.53 kg/s

No, the answer is incorrect.
Score: 0
Accepted Answers:
3.53 kg/s

13) The Power consumed by fuel pump is: *1.5 points*

- 3.9 kW
- 6.8 kW
- 9.7 kW
- 13.6 kW

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

14) The Power consumed by oxidizer pump is: *1.5 points*

- 33.2 kW
- 63.8 kW
- 89.7 kW
- 103.6 kW

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

15) The power generated by the turbine is: *1 point*

- 39 kW
- 54 kW
- 44 kW
- 49 kW

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

16) Consider the following problem statement to answer questions from Q.16-17 *2 points*

A liquid propellant rocket engine based on gas generator feed cycle produces thrust of 800 kN with I_{sp} of 320 s. The fuel and oxidizer are operating at mixture ratio of 1.85 whereas the propellant supply chamber pressure is 7 MPa. The fuel with density of 1100 kg/m^3 is stored in the propellant tank at a pressure of 0.75 MPa and the oxidizer with density of 900 kg/m^3 is stored at 0.55 MPa. A single turbine with mechanical efficiency of 0.93 generate total power of 2300 kW to drive oxidizer and fuel pumps. The ratio of isentropic efficiencies of oxidizer to fuel pump is 5:6.

Isentropic efficiency of the oxidizer pump is:

- 0.72
- 0.75
- 0.78
- 0.81

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.75

17) Isentropic efficiency of the fuel pump is: *2 points*

- 0.97
- 0.94
- 0.9
- 0.86

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.9