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BASE-002

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

December, 2015

BASE-002 : ROCKET PROPULSION

Time : 3 hours *Maximum Marks : 70*

Note :

(i) *Attempt any **seven** questions.*

(ii) *All questions carry equal marks.*

(iii) *Use of scientific calculator is permitted.*

(iv) *Assume suitable data, if missing.*

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1. Explain in detail the safety criteria of a missile launch for parent aircraft. *10*

2. Derive an expression for the time of climb of a missile. Explain the assumptions in detail. *10*

3. Discuss the basic inputs for design of a solid propellant rocket. *10*

4. A turbo jet engine travels at 216 m/s in air at 0·78 bar and – 7·2°C. Air first enters the diffuser (of 0·78 bar) in which it is brought to rest relative to the unit and it is then compressed in a compressor through a pressure ratio of 5·8 and fed to a turbine at 110°C. The gases expand through the turbine and then through the nozzle to atmospheric pressure (0·78 bar). The efficiencies of diffuser, nozzle and compressor are each 90%. The efficiency of turbine is 80%. Pressure drop in combustion chamber is 0·168 bar.

Determine :

(i) Air fuel ratio, and

(ii) Total thrust, if the inlet cross-section of diffuser is 0·12 m^2. *10*

Assume calorific value of fuel as 44150 kJ/kg of fuel.

5. Describe the working of a Ram-Jet engine. Depict the various processes occurring in it on the h-s diagram. *10*

6. Explain with a neat sketch all forces and moments acting on the two separating stages in a multi-stage rocket. *10*

7. What is thermal protection system ? Describe a thermal protection system based on heat dissipation. *10*

8. Differentiate between any ***two*** of the following : *2×5=10*

(a) Mass loading and Volume loading concepts

(b) Missile and Rocket

(c) Homing command guidance and Beam rider guidance

9. Write short notes on any ***two*** of the following : *2×5=10*

(a) Flight Dispersion

(b) Geysering

(c) Solid Propellants