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BASE-002

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00146

June, 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 missing data suitably, if any.*

1. Differentiate between any ***two*** of the following : *5+5=10*

(i) Double base propellant and Composite propellant

(ii) Centre of pressure and Aerodynamic centre

(iii) Ram-Jet engine and Turbo-Jet engine

2. Explain the purpose and utility of rockets. Briefly describe the different sub-systems of a rocket. *10*

3. Is missile aerodynamics different from aircrafts' aerodynamics ? Discuss each parameter that differentiates the two dynamics. *10*

4. In a jet propulsion unit, air is drawn into the rotary compressor at 15°C and 1·01 bar and delivered at 4·04 bar. The isentropic efficiency of compressor is 82% and the compression is uncooled. After delivery the air is heated at constant pressure until the temperature reaches 750°C. The air then passes through a turbine unit which drives the compressor only and has an isentropic efficiency of 78%, before passing through the nozzle and expanding to atmospheric pressure of 1·01 bar with an efficiency of 88%. Neglecting any mass increase due to the weight of the fuel and assuming that R and γ are unchanged by combustion, determine :

   (i) The power required to drive the compressor,

   (ii) The thrust per kg of air per second. *5+5=10*

5. Explain in brief the internal ballistic parameters, thrust coefficient and specific impulse. *5+5=10*

6. Describe the working of Turbo-Jet engine. Also discuss its advantages and limitations. *10*

7. Derive an expression for exit plane velocity for the flow through a rocket nozzle. Also explain why role of gamma (γ) is not observed on exit plane velocity. *10*

8. Explain in brief the future trends in rockets. *10*

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

(a) Guidance System of Missile

(b) Boost Sustained Trajectory

(c) Staging in Rockets