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BAS-024

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00735

December, 2014

BAS-024 : INTRODUCTION TO ROCKET AND MISSILES

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***seven*** *questions. All questions carry equal marks. Use of calculator is permitted. Assume suitable missing data, if any.*

1. Describe the different methods of thrust vector control of a rocket. *10*

2. Compare and contrast the pyrotechnics and pyrogen type of igniters, using neat sketches. *10*

3. Derive an expression for the ideal velocity achieved by a rocket in free space. State all the assumptions made. *10*

4. Discuss the materials used in the fabrication of any two components of a rocket and the reasons for selecting those materials. *10*

5. What are the future trends in rockets ? Explain in detail. *10*

6. Explain various materials used for missiles giving their characteristics with respect to their functions. *10*

7. Draw the external configuration of a rocket and explain the different aerodynamic forces and moments acting on it. How do you obtain the non-dimensional coefficients corresponding to these and how do they vary with Mach number ? *10*

8. Write short notes on the following : $4 \times 2\frac{1}{2} = 10$

   (a) Classification of missiles

   (b) Body upwash

   (c) Design of a stable rocket

   (d) Rocket dispersion

9. (a) A cruise missile is launched from the ground and is climbing with the rate of 2,400 ft/min. Missile is required to achieve an altitude of 12,000 ft for cruise, where its rate of climb is 900 ft/min. Calculate the time of climb for the missile. Calculate variation on outage if engine mixture ratio repeatability is changed to 2%. (Assume $\partial MR_B/\partial MR_E = 1$) *5*

   (b) A missile having launch weight 20,000 lbs, rocket motor weight 14,150 lbs, propellant weight 12,000 lbs and specific impulse at 240 seconds is considered for multi-staging. If two stages are employed in the same missile having the weight of each rocket motor as 7,075 lbs and weight of propellant in each motor is 6,000 lbs, what would be the rise in the burn-out velocity in percentage ? *5*
