

**B.Tech. AEROSPACE ENGINEERING
(BTAE)**

Term-End Examination

00075

December, 2014

BASE-002 : ROCKET PROPULSION

Time : 3 hours

Maximum Marks : 70

Note :

- (i) Answer any **seven** questions.
 - (ii) All questions carry equal marks.
 - (iii) Use of scientific calculator is permitted.
 - (iv) Assume missing data suitably.
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1. (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. 2
- (b) Calculate variation on outage if engine mixture ratio repeatability is changed to 2%.
[Assume $\partial MR_B / \partial MR_E = 1$] 2

- (c) A missile having launch weight 20,000 lbs, rocket motor weight 14,150 lbs, propellant weight 12,000 lbs and specific impulse of 240 seconds is considered for multistaging. 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 ? 3
- (d) Explain jet controls in brief. 3
2. (a) Derive equation for normal force coefficient for thin wedge shaped airfoils used in missile. 5
- (b) Explain Boost sustained Trajectory. 5
3. (a) What are the important properties required for a good propellant used for a rocket engine ? 5
- (b) What are the different advantages and disadvantages of solid propellant over a liquid propellant ? 5
4. (a) Describe the working of a Ramjet Engine. 3
- (b) Depict the various thermodynamic processes occurring in it on h-S diagram. 3
- (c) What is the effect of flight parameter on its efficiency ? 4
5. Derive equation of range for short range ballistic missile considering flat earth rectilinear co-ordinate system. 10

6. What are the assumptions for flow through an ideal nozzle ? Discuss each assumption. 10
7. (a) Write a short note on optimum bias. 5
- (b) What is geysering ? Explain sequence of events for geysering cycle. 5
8. Explain mass loading and volume loading concept. Show that volume loading concept is better than mass loading concept. 10
9. (a) What is flight dispersion ? Explain it briefly. Classify the parameters affecting flight path. 5
- (b) What are the safety criteria of missile launch for parent aircraft ? 5
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