Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIIth SEMESTER–EXAMINATION – MAY/JUNE- 2012

Subject code: 170104 **Date: 28/05/2012**

Subject Name: Rocket & Missile Configurations Design

Time: 02:30 pm – 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Attempt all **07**

1) A cruise missile is launched from the ground and climbing with the rate of 2400ft/min. Missile is required to achieve an altitude of 12000ft for cruise, where its rate of climb is 900ft/min. Calculate time to climb for the missile. (2 marks)
2) Calculate variation on outage if engine mixture ratio repeatability is changed to 2%. (Assume $\partial MR_B / \partial MR_E = 1$) (2 marks)
3) A missile having launch weight 20,000lb, rocket motor weight 14150lb, propellant weight 12,000lb and specific impulse of 240sec is considered for multi staging. If two stages are employed in the same missile having the weight of each rocket motor is 7075lb and weight of propellant in each motor is 6000lb. what would be the rise in the burn-out velocity in percentage? (3 marks)

(b) Write a short note on jet controls. **07**

Q.2 **(a)** Classify missile according to purpose and explain any one in detail. **07**

(b) Derive equation for normal force co-efficient for thin wedge shaped airfoils used in missile. **07**

OR

(b) Explain Boost Sustained Trajectory **07**

Q.3 **(a)** Which are the desired physical properties of liquid propellant? **07**

(b) Explain liquid propellant combustion process and different zones of it. **07**

OR

Q.3 **(a)** Write solid propellant characteristics. **07**

(b) Discuss importance of the various ingredients of solid propellant. **07**

Q.4 **(a)** What is flight dispersion? Explain it briefly. Classify parameters affecting flight path **07**

(b) What are the safety criteria of missile launch for parent aircraft? **07**

OR

Q.4 **(a)** Derive equation of range for short range ballistic missile considering flat earth, rectilinear co-ordinate system. **07**

(b) What is launch boundary in air launch of missile? Explain launch aircraft trajectory & missile trajectory and discuss how launch boundaries are determined from them? **07**

Q.5 **(a)** Explain mass loading and volume loading concept, show that volume loading concept is better than mass loading concept. **07**

(b) How maximum loadable volume is obtained? **07**

OR

Q.5 **(a)** Write a short note on *Optimum Bias.* **07**

(b) What is geysering? Explain sequence of events for geysering cycle. **07**

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