Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-VII Examination-Nov/Dec.-2011

Subject code: 170104 **Date: 26/11/2011**

Subject Name: Rocket and Missile Configuration Design

Time: 10.30 am-01.00 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) Drag of missile body primarily depends on what?
2) Which are the optimum launch angles in actual and drag free conditions for maximum range of any ballistic missile?
3) Give expression for the stall speed for cruise missile.
4) Define: *Outage*.
5) Enlist major consideration for good propellant load control.
6) Give reason: *Tanks are loaded as close to launch as possible in liquid propellant rocket*.
7) What is *Gelled Propellants*?

(b) 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 1%. (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)

Q.2 **(a)** Explain the effect of Aspect Ratio on the wing of missile. **07**

(b) Explain temperature and pressure effects on Cryogenic loading. **07**

OR

(b) Define Boost glide trajectory? Explain graphical method to determine it. **07**

Q.3 **(a)** Enlist different parameters that can disperse flight path during boost phase and explain any two of them in detail. **07**

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

OR

Q.3 **(a)** 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**

(b) Derive thrust equation of rocket. What is *divergence co-efficient* & *thrust co-efficient*? **07**

Q.4	**(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.4	**(a)**	Write solid propellant characteristics.	**07**
	(b)	Discuss the ingredients of solid propellant.	**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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