# SRINIVASAN ENGINEERING COLLEGE, PERAMBALUR

## PART B

### UNIT I

1. List & explain design consideration for liquid rocket combustor volume & shape.
2. Explain the types of igniters.
3. Explain the components of igniters.
4. Explain the types of propellant feed systems.
5. Sketch & explain a typical 1-d model of combustion mechnismof a composite social propellants. Sketch the temperature profile in both phases of the propellant.
6. Explain combustion instability & its controlling procedures in thrust chamber.
7. Derive the Tsiolkovsky's equation for rocket motion in free space.
8. The specific impulse of a rocket is 282 sec, Its structural efficiency is 0.09. Ideal velocity increment in free space is 8.9km/s. Calculate payload ratio, mass ratip&propellant ratio.
9. Explain propellant hammer &Gysering effect in LRE.
10. Explain combustion system &combustion mechanism for SRE.

### UNIT II

1. Explain the types of forebody mid-body & tail section used in the rockets & missiles
2. With neat sketch distinguish b/w body upwash&body downwash.
3. Sketch self impinging type &splash plate type in LR injector with its advantage &disadvantage.
4. Sketch the various forces &moments acting on a missile while passing through atmosphere.
5. Classification of missiles
6. With neat sketch& explain the types of aerodynamic surfaces used in the rockets & missiles
7. Sketch the various forces &moments acting on a rocket projectile.
8. Explain the types of drag .
9. What are drag estimation & interference effect.

### UNIT III

1. What is rocket dispersion? Explain the factors that cause rocket dispersion
2. What are the various components of drag experienced by a rocket while passing through atmosphere.
3. With neat sketch& explain how fins impart stability to a rocket in flight .
4. Sketch the shapes & show the typical pressure coefficient variations over the aerodynamic surfaces.
5. How wave drag & its coefficient can be estimated for double wedge, modified double wedge, biconvex profiles of supersonic airfoils.
6. List the basic aerodynamics design considerations for the development of air-to-air missiles. What are the factors that limits the range of such missile?
7. With neat sketch& explain the lateral aerodynamic moment of a rocket & briefly eludicate the variation of lateral aerodynamic moment coefficient variation with angle of attack. How does the variation affect the stability of the rocket.
8. Derive an expression for the rocket motion in the homogeneous gravitational field.
9. Derive an expression for the burn out ran

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## UNIT IV

1. Explain Gravity turn trajectors.
2. Derive an expression for the burn out time interms of specific impulse, mass ratio & thrust to weight ratio of rocket for the conditions that the rocket develops both constant &varying thrust.
3. Obtain expression for the burn out altitude & culmination altitude attained by a sounding rocket for the conditions that the rocket develops both constant &varying thrust. Aerodynamic forces are negligible.
4. A rocket undergoes an inclined trajectory with constant pitch angle. The rocket develops constantthrust & its motion is in homogeneous gravitation field. Derive an expression for the burn out velocity & burn out altitude. Show that the resticalcomponent of velocity in zero at culmination. Aerodynamic forces are negligible.
5. Explain what are kick angle, Staging, Jetavators& Thrust termination.
6. Explain TVC & its methods by which it can be achived.
7. Calculate the culmination range & altitude reached by a rocket after burnout with following data. Specific impulse= 278 sec. T/W= 1.48, mass ratio=5.2, pitch angle= 41.2º. Assume that the rocket is tracing an inclined trajectory with constant pitch angle for the conditions that the rocket develops both constant &varying thrust. Aerodynamic forces are negligible.
8. Explain multistaging rocket vehicle & its nomenclature. What are the separation stages within the atmosphere?
9. What is coasting phase? What is its importance in the design philosophy of multistaging rocket.
10. Explain the aerodynamics characteristics of canard controls.

## UNIT V

1. What are the possible materials that can be used for nose/fore body, wings, &interstage couplings of short & long range ballistic missiles? Justify your answer.
2. What are the selection consideration of material to be used for the construction of thrust chamber of SRE & LRE.
3. Explain the ablation cooling method of re-entry bodies.
4. Suggest materials for the following:
   RE-entry nose cones, wing LE, rocketnozzle thrust inserts & fins.
5. Explain the principle behind the SITVC with neat sketch. What are the various types of fluids that can be usedb for secondary injectors?
6. Explain the various selection criteria for the aerospace application materials.
7. List the factors that promotes the smooth stage separation for a multistaging vehicles.
8. Explain how vehicle optimisation is carried out for a n- stage launch vehicle.
9. Explain the effect of space environment on materials & list the materials that can withstand this effect.