



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500043

AERONAUTICAL ENGINEERING ASSIGNMENT QUESTIONS

Course Name	:	LAUNCH VEHICLE AND MISSILE TECHNOLOGY
Course Code	:	A82132
Class	:	IV B. Tech II Semester
Branch	:	AERO
Year	:	2018 – 201
Course Coordinator	:	Mr. G S D Madhav, Assistant Professor , Dept. of Aeronautical Engineering
Course Faculty	:	Mr. G S D Madhav, Assistant Professor, Dept. of Aeronautical Engineering

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S. No	Question	Blooms Taxonomy Level	Course Outcome
ASSIGNMENT-I			
UNIT-I Introduction			
1	Enumerate the importance of a) space launch vehicle b) military missiles in conjunction with their i) functions and ii) types.	Understand	1
2	Explain the role, mission and mission profile of air to air missiles.	Understand	1
3	Describe the role of propulsion system in the design of SLV.	Remember	1
4	Discuss the role of propulsion system in the design of military missiles.	Understand	2
5	Highlight the typical design methodology involved in realizing a space launch vehicle with sketch.	Understand	1
6	Explain in detail the team process flow chart involved within a SLV design program.	Remember	3
7	Consolidate various SLV programs of different nations and typical launch vehicle version/modes used in India; USA; USSR; China; Japan; Europe	Remember	1
8	Detail the role of ballistic missile and cruise missile.	Understand	1
9	What is role of sounding rocket? What is the maximum altitude attained by it.	Understand	2
10	Describe the material selection for launch vehicles and missiles.	Understand	1
UNIT-II Solid & Liquid Propellant Rocket Motor Systems			
1	Explain the principles of solid propellant rocket systems involving the hardware components.	Understand	4
2	Enumerate application aspects of rocket motor in launch vehicles and missiles.	Remember	5
3	Classify solid propellants according to various categories and elaborate on fuel oxidizer matrix composition.	Understand	4
4	Exemplify the importance of propellant grain and its desirable properties and nomenclature associated with it.	Understand	5
5	List and explain the physical properties evaluation of solid propellant matrix.	Understand	4

S. No	Question	Blooms Taxonomy Level	Course Outcome
6	Draw and explain working architecture involved with a liquid propellant rocket system in detail	Remember	4
7	Exemplify role of turbo-pumps in propellant supply of rocket engine with a suitable sketch.	Understand	4
8	Classify liquid propellants and exemplify them in detail with respect to their composition.	Understand	4
9	List and explain the criteria involved in selection of liquid propellants with respect to their physical and chemical characteristics.	Understand	5
10	State and describe the starting and ignition sequence characteristics involved with rocket engines.	Remember	5
UNIT-III			
Aerodynamics of Rockets And Missiles			
1	Give a broad classification of missiles based on i) Range ii) Usage/launch	Remember	7
2	Explain briefly about the classification of missiles based on i) Guidance systems ii) control surfaces.	Remember	5
3	Enumerate the forces acting on a missile while passing through atmosphere with a schematic diagram.	Understand	5
4	Detail the methods of obtaining a) aerodynamic forces and moments, b) lateral aerodynamic moment.	Remember	7
5	Discuss the methods of obtaining a) damping moment and b) lateral moment of a rocket with necessary correlations.	Understand	6
ASSIGNMENT-II			
6	Give an estimate of lift and drag forces experienced by a rocket with suitable correlations.	Understand	6
7	Define drag coefficient. List various types of drag experienced by a launch vehicle/flight envelop of missile and obtain/deduce necessary equation for wave drag coefficient estimation for a conical body.	Remember	7
8	What is lift? List various types of drag experienced by a launch vehicle/flight envelop of missile and obtain/deduce necessary equation for wave drag coefficient estimation for a rectangular wing.	Remember	7
9	Describe the forces acting on re-entry module. What happens if we increase flight path angle?	Understand	7
10	Explain the difference between lifting re-entry and ballistic re-entry.	Understand	7
ASSIGNMENT – IV			
UNIT-IV			
Dynamics And Attitude Control of Rockets And Missiles			
1	Derive the Tsiolkovsky's rocket equation with a neat sketch and obtain the range estimation in the absence of gravity.	Remember	6
2	Deduce the rocket equation for a rocket launched in vertical motion in the earth's gravitational field.	Remember	6
3	Obtain the rocket equation for a rocket launched with an inclined motion and flight path at constant pitch angle.	Understand	6
4	Explain the concept of multi-staging and give preliminary weight estimation for a multi-stage rocket with necessary equations for velocity increment requirements.	Remember	7
5	With neat sketches explain the general launch profile of Pegasus (drop/air launch) launcher.	Remember	6
6	List and discuss the conceptual basis for thrust vector control in rocket and missiles.	Understand	7
7	Categorize the various thrust vector control methods and explain with a schematic hinge/gimbal scheme.	Understand	7
8	Detail the TVC mechanism with ball and socket type arrangement with suitable sketch.	Understand	6

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9	Explain the conceptual working of a) fluid bearing nozzle b) flexible seal nozzle c) flexible exit types of thrust vector control mechanisms with suitable sketches.	Understand	6
10	List and explain the working architecture of separation techniques used in SLV separation <ul style="list-style-type: none"> a. Stage separation with inatmosphere b. Lateral separationcharacteristics c. Stage separation inspace d. Separation by compressionsprings e. Separation of satellitelifairings 	Understand	6
ASSIGNMENT – V UNIT-V Rocket Testing			
1	Enumerate the working architecture for ground testing and flight testing sequence of launch vehicles/rockets/missiles.	Understand	7
2	List the various types of test conducted for launch vehicles/rockets and explain any one sequence with suitable example.	Understand	7
3	Discuss about the various test facilities requirements and safe guards to be implemented for smooth functional aspect.	Understand	7
4	Detail the choice of materials for insulators and inhibitors at cryogenic temperature and list it types.	Understand	7
5	Explain the selection of materials for liners at cryogenic temperature and name some of the materials.	Understand	7
6	What is the importance of choice of materials for propellant tanks and designs?	Understand	7
7	Briefly explain the criteria involved in selection of materials for rockets and missiles.	Understand	6
8	Illustrate the importance of following procedures a) ground testing b) flight testing.	Remember	6
9	Characterize the need for monitoring and control of toxic material during rocket testing and mention some strategies in meeting them	Remember	7
10	Demonstrate the importance of following procedures a) trajectory monitoring management b) post accident events.	Understand	7

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