

Code: 9A21401

B.Tech II Year II Semester (R09) Regular & Supplementary Examinations, April/May 2013

INTRODUCTION TO AEROSPACE ENGINEERING

(Aeronautical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) How the human efforts to fly do literally got off the ground on Nov 21, 1783?
(b) Who is the "True Inventor of the Airplane"? Explain about his contribution in aeronautical field?
- 2 Explain developments in science and technology that took place during the stone age, bronze age, and iron age.
- 3 What are the aerodynamic forces on a wing? Explain in three ways how lift is produced with neat sketches.
- 4 Explain the required criteria for longitudinal stability with neat sketches and effect of canard configuration.
- 5 What is microgravity? Explain in detail the benefits of microgravity on human performance.
- 6 Establish the requirement of communication in a space mission. Describe the space communication architecture in detail.
- 7 Write a short note on the various Indian organizations like DRDO, ISRO etc in the development of missile and space technology.
- 8 "Design is a skill, a critical component of engineering education". Justify the statement in your points.

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1. (a) Illustrate briefly about the progress of aircraft propulsion system till the first powered assisted take off by Wright Brothers.
(b) Present a detailed note on "Aeronautical Triangle" and their contributions.
2. Discuss briefly about the industrial revolution in INDIA through bronze age, iron age and middle age.
3. Describe the nomenclature of airfoil and explain the flow mechanism involved in stalling with neat sketches.
4. What are the different types of stabilities? Enumerate the required criteria for directional and lateral stability.
5. Explain briefly about the following terms:
(a) Earth radioactive environment.
(b) Meteoroids and Micrometeoroids
6. Write a detailed note on the responsibilities and tasks related to operations teams of a space mission.
7. (a) Write a short note on first manned flight to moon.
(b) Write about international space station.
8. Write a detailed note on computer aided design/drafting (CAD).

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1. What is space? Explain what are the different categories to launch a space vehicle and its re-entry to earth?
2. How did the development of electricity give rise to the industrial revolution in the late 1700s?
3. (a) Obtain the expression for LIFT coefficient from pressure coefficient with neat sketches.
(b) Consider an airfoil with chord length c and the running distance x measured along the chord. The leading edge is located at $x/c = 0$ and the trailing edge is located at $x/c = 1$. the pressure coefficient variations over the upper and lower surface are
$$C_{p,u} = 1 - 300(x/c)^2 \quad \text{for } 0 \leq (x/c) \leq 0.1$$
$$C_{p,u} = -2.2277 + 2.2777(x/c) \quad \text{for } 0.1 \leq (x/c) \leq 1.0$$
$$C_{p,u} = 1 - 0.95(x/c) \quad \text{for } 0 \leq (x/c) \leq 1.0$$
Calculate the normal force coefficient.
4. Illustrate the anatomy of the airplane, helicopter, missiles and space vehicles with neat sketch.
5. (a) What is space debris and mention the causes for it?
(b) Write about the structure of magnetosphere.
6. Write short notes on the following with regard to propulsion and station keeping practices:
 - (a) Satellite orbit change.
 - (b) Attitude control.
 - (c) Satellite End-of-life (EOL) disposal.
7. Compare between manned and unmanned space missions.
8. Explain briefly the design procedure involved in the lighter-than-air vehicle student project of MIT.

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1. Elaborate about the commercial use of space. Where do we find the permanent presence of humans in space? Explain about first manned space flight?
2. Explain developments in engineering that took place during the Hellenistic period and middle ages.
3. What is the basic principle behind thrust? Explain how thrust is produced for propeller, jet and rocket engines?
4.
 - (a) What are the different performance parameters? How they affect unaccelerated flight?
 - (b) "Lift = Weight and Thrust = Drag is the condition steady flight" then explain which force makes to move the aircraft during this condition.
 - (c) The maximum lift to drag ratio 7.7. If the aircraft engine fails at 25 km altitude, how far it can glide in terms of distance along the ground?
5.
 - (a) Discuss the reasons for choosing a white colored thermal micrometeorite material as the outer garment for a space suit.
 - (b) Describe two solutions in practice to overcome the space debris problem.
6. With the help of a neat sketch, explain the working of an Omni-directional antenna creating uplink and downlink of data with the satellite.
7. Discuss in detail the NASA plans of a comprehensive space program to place a space station with permanent human presence in low earth orbit and other relevant technical aspects.
8. Enumerate the design procedure for a FLYING CAR student project in your view.
