Code No: A109212101   **R09**   **Set No. 2**

II B.Tech I Semester Examinations,May/June 2012
INTRODUCTION OF AEROSPACE ENGINEERING
Aeronautical Engineering

Time: 3 hours   Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. Write a detailed note on Computer Aided Design / drafting (CAD).   [15]

2. (a) What do you understand by "Engineering"?

   (b) Write a short note on the human-powered hydrofoil project with the help of a neat sketch.   [7+8]

3. (a) "Lilienthal was the first human to be photographed in an airplane as a pilot" and got his research work published as articles. Elaborate.

   (b) Present a detailed note on the work of German researcher Lilienthal with regard to glider experiments.   [7+8]

4. Compare the way airplanes and rockets fly.   [15]

5. What do you understand by 'Extravehicular Activity'? Enumerate experiences gained by humans through various space missions and associated EVAs.   [15]

6. Write short notes on the following:

   (a) Lift curves for symmetrical and cambered airfoils

   (b) The effect of Reynolds number on lift curve

   (c) The effect of Reynolds number on drag curve   [5+5+5]

7. Discuss environmental constraints that a spacecraft designer considers during design and development of a space vehicle. Also describe the current methods available to overcome such effects.   [15]

8. Explain how telemetry data is useful in monitoring the satellite and suggesting operational corrections if required. Mention the frequency ranges employed in satellite communication for various applications.   [15]

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R09

Set No. 4

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Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. Write a detailed note on Space Shuttle

   (a) as a part of Satellite deployment
   (b) with respect to suitability for human flight. [7+8]

2. Write short notes on the following:

   (a) Space debris
   (b) Orbits
   (c) Microgravity [5×3]

3. (a) Differentiate between the vertical thinking of yes/no method and the lateral thinking method in the design process.
   (b) Write about 'concurrent engineering process'. [7+8]

4. Over the ages there was a steady development - Justify. [15]

5. Write short notes on the following:

   (a) Drag polars for symmetrical and cambered airfoils.
   (b) The effect of Reynolds number on lift and drag curves.
   (c) Coefficient of lift (C_L) versus angle of attack (α) curve. [5+5+5]

6. Why does the design of a satellite call for incorporation of a thermal control system? How does the heat generated in a satellite system get dissipated? Explain. [15]

7. (a) Describe a glider.
   (b) Compare the works carried out by the German engineer Lilienthal and Scot engineer Percy Pilcher during 19th century in the area of building and experimenting gliders. [5+10]

8. (a) Discuss stability of a rigid body in general.
   (b) Discuss the stability of an aircraft. [5+10]

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1. Write short notes on the following:

   (a) Plan view of a drawing

   (b) Elevation of a drawing

   (c) Sectional view.   [3×5]

2. (a) Define 'engineering' in your own words and further explain various items that could be included in engineering to evolve 'engineering design'.

   (b) Write about some of the important technological developments that took place during Alexander's regime [1st century b.c.e. (B.C.)]   [8+7]

3. (a) Write a detailed note on microgravity. What is the magnitude of microgravity in terms of gravitational force of acceleration of Earth?

   (b) Assuming 6370 km as the radius of the earth estimate the distance above the surface of the earth where the microgravity effects or near-weightless condition could be felt.   [8+7]

4. (a) Discuss the sources drag for an aircraft.

   (b) Explain how lift is obtained for an aircraft.   [15]

5. Write notes on

   (a) Life support system in space.

   (b) Flight safety

   (c) Apollo Mission   [15]

6. Write short notes on

   (a) Operational satellite system consisting of multiple satellites.

   (b) Space mission.

   (c) Station keeping of a satellite.   [5+5+5]

7. (a) Describe a glider.

   (b) Narrate how the Scot origin Marine engineer Percy Pilcher had extended the works of German researcher Lilienthal in building successful gliders. What made him design and construct an engine to power his gliders?   [5+10]

8. The lift of the wing of an aircraft is 4000 N acting 4 m from the nose of the aircraft. The centre of gravity is at 4.5 m from the nose. The tail produces 900 N lift 10 m from the nose. Is the aircraft statically stable if its mass is 500 kg? [15]

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1. Narrate and explain the observations of Nicholas Copernicus and Isaac Newton, which laid the foundations for understanding nature and the subsequent technological developments in space engineering. [15]

2. (a) Write a detailed note on the motivation of the United States to develop a space program.

   (b) Explain the accomplishments of the two women pioneers of aviation. [8+7]

3. (a) Explain the nomenclature of NACA 4 digit series, and NACA 5 digit series of airfoils.

   (b) Draw and explain the $C_L-\alpha$ characteristic curve for an airfoil. [8+7]

4. Consider an aircraft in flight inclined at an angle with the horizon. Obtain the equations of motion in terms of lift (L), drag (D), angle of inclination (θ) , mass of the aircraft (m) and velocity of aircraft (V). [15]

5. Differentiate between design process and design drawing. [15]

6. Write a detailed note on microgravity EVA that suits planetary related human spaceflight programs. [15]

7. Present a detailed report on an oceanographic mission as a case study. [15]

8. Write a detailed notes on Skylab and Apollo-Soyuz programme. [15]

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