Karunya University

(Karunya Institute of Technology and Sciences)
(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – November/December 2010

Subject Title : INTRODUCTION TO AEROSPACE ENGINEERING   **Time : 3 hours**
Subject Code: 09AE201   **Maximum Marks: 100**

Answer ALL questions
PART – A (10 x 1 = 10 MARKS)

1. Who enunciated the wind tunnel principle – "Effect is same whether air is moving over the body or body is moving through the air"?
2. The instrument Altimeter used in the aircraft provides the reading for _____
3. For pitching up the Aircraft, following control surface is used.
   a. Flap – downward   b. Rudder
   c. Elevator – downward   d. Elevator - upward
4. The Service Ceiling of the aircraft is the altitude at which the maximum rate of climb is
   a. 100m/s   b. 30m/s   c. 100km/hr   d. 30km/hr
5. The choice of material for aerospace use depends upon its
   a. Strength   b. Weight or density   c. Ratio of strength to weight
6. Cryogenic fuel for rocket has Fuel-Oxidiser combination as _____ and _____
7. Velocity of satellite at Apogee is _____ compared to that at Perigee.
8. Rocket equation gives the relation between
   a. Velocity gained, initial mass and Specific Impulse
   b. Initial mass, final mass and Specific Impulse
   c. Velocity gained and final mass
   d. Velocity gained, initial mass, final mass and Specific Impulse
9. Expand FAR.
10. A wind tunnel having a test section Mach number of 0.5 is
    a. Subsonic Wind Tunnel   b. Transonic Wind Tunnel   c. Supersonic Wind Tunnel

PART – B (5 x 3 = 15 MARKS)

11. What is Ailron? What is its use and how does it help in aircraft maneuver?
12. Explain with proper figures, the terms static and dynamic stability of the aircraft.
13. What are the main structural components of aircraft wing?
14. In the light of Kepler's law, explain the variation of velocity of earth satellite as it moves from Apogee to Perigee.
15. In Supersonic Wind Tunnel, Stagnation pressure and Stagnation Temperature are 1000kPa and 300K respectively. When the flow expands to Mach 3 in the test section, what is the pressure and temperature? (Assume $\gamma = 1.4$)

PART – C (5 x 15 = 75 MARKS)

16. Name the basic instruments for Flying. Explain the working of following instruments in detail describing what these measure and what these indicate.
    a. Altimeter
    b. Air Speed Indicator

(OR)

17. Describe the Ramjet engine and compare its working with that of SCRAMjet engine.

18. Discuss in detail about the aircraft performance parameters.

(OR)

19. Consider an aircraft with the following specification:

    | Total weight | : | 12500 N | Wing Area | : | $6.12 \, m^2$ |
    | Maximum Thrust : | | 2600 N | C_{Do} | : | 0.032 |
    | β | : | 0.1 | C_{Lmax} | : | 1.22 |

    For sea level flight (sea level air density 1.225 kg/m^3), find minimum, maximum velocity and maximum climb rate.

20. List the various materials used in the construction of Aircraft. Discuss the conditions under which each material is used.

(OR)

21. Describe the various components of Jet Engine and discuss the mechanism of thrust production for Jet Engine.

22. Derive the Rocket equation. Find the Velocity change for Two stage Rocket. For the same Payload mass M_L and same total Propellant mass (M_{P1} + M_{P2}) and same structure mass (M_{S1} + M_{S2}), compare the total gain in velocity for Single stage and Two Stage rocket.

(OR)

23. Discuss the environmental considerations which govern the design of the Spacecraft. How are these different from that of Aircraft?

24. What are the types of Aircraft Certification? Explain.

(OR)

25. What are the different steps involved in wind tunnel testing? Explain each step briefly.