

**B.E., DEGREE EXAMINATIONS: MAY/JUNE 2013**

Sixth Semester

**AERONAUTICAL ENGINEERING**

AER115 : Flight Dynamics

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. \_\_\_\_\_ is the outer fringe of the earth's atmosphere, where very few molecules are found in this region and this region gradually merges into the interplanetary space.
  - a) Stratosphere
  - b) Mesosphere
  - c) Exosphere
  - d) Ionosphere
2. \_\_\_\_\_ is a type of lift dependant drag.
  - a) Skin Friction Drag
  - b) Pressure Drag
  - c) Profile Drag
  - d) Induced Drag
3. The altitude at which the  $(R/C)_{\max}$  equals to zero is called \_\_\_\_\_.
  - a) Absolute ceiling
  - b) Service ceiling
  - c) Normal ceiling
  - d) Adverse ceiling
4. Power produced by the piston engine propellers are denoted by \_\_\_\_\_.
  - a) Metric Horse Power
  - b) Thrust Horse Power
  - c) Drag Horse Power
  - d) Shaft Horse Power
5. The recovery of an airplane from a dive or a glide is called a \_\_\_\_\_ maneuver.
  - a) Pull out
  - b) Pull down
  - c) Push in
  - d) Push out
6. \_\_\_\_\_ is one of the device used to increase the lift co-efficient during take-off flight
  - a) Spoilers
  - b) Trim tab
  - c) Flaps
  - d) Rudder
7. For longitudinal static stability, the position of c.g. must be always \_\_\_\_\_.
  - a) Forward of neutral point
  - b) Behind of neutral point
  - c) At the nose of airplane
  - d) At the tail of airplane
8. The stability in pitching is called as \_\_\_\_\_.
  - a) Lateral stability
  - b) Directional stability
  - c) Longitudinal stability
  - d) Neutral stability



(ii) A jet airplane has its maximum all up weight of 35,000N and gross wing area of 300 m<sup>2</sup>. The drag polar is given by  $C_D = 0.015 + 0.05 C_L^2$ . The weight fraction of usable fuel is 34% for a long range version. The SFC of the jet engine is 0.07 Kg/N-hr. Determine the maximum range and endurance for this airplane. (9)

23. a) Estimate the total take off and landing distances for an aircraft and explain the methods to reduce the landing distance.

**(OR)**

b) How does true airspeed differ from equivalent airspeed? Show the importance of equivalent airspeed for V-n Plot. Explain the corner points for their significance and importance in the aerodynamic/structural considerations during the life cycle of an airplane.

24. a) Explain in detail about the Wing contribution to Pitching stability with neat sketch and derive the necessary equations?

**(OR)**

b) Derive the equations of motion of an airplane constrained to the plane of symmetry at constant speed and also derive the characteristic equation of an airplane dynamics. Discuss the solutions.

25. a) (i) Discuss in detail the contribution of various components of the airplane on static directional stability (7)

(ii) Explain the effect of dihedral on static lateral stability with neat sketch. (7)

**(OR)**

b) Derive the expression for the pedal force for the rudder of an airplane as a function of hinge moment coefficients.

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