BAS-009

B.Tech. IN AEROSPACE ENGINEERING PROGRAMME (BTAE)

01368

Term-End Examination
June, 2010

BAS-009 : INTRODUCTION TO AERONAUTICS

Time : 3 hours   Maximum Marks : 70

Note :   Question number 1 is **Compulsory**. Attempt **any six**
         Questions from Question No. 2 to Question No. 10.
         Use of calculator is permitted.

1.   Fill in the blanks :
     (a)   Tail plane ahead of wing is known as   1
           _____ design.
     (b)   Relative density = _____.   1
     (c)   The centroid of the distributed aerodynamic   1
           load on the aerofoil is the point at which
           the equivalent concentrated force acts. The
           point is called _____.
     (d)   The high speed limit velocity is _____   1
           for the airplane and should never be
           exceeded.
     (e)   Form drag + skin friction drag =_____.   1
     (f)   Free stream Mach number at which sonic   1
           flow is first encountered at some location
           on the aerofoil is _____.

(g) Location of separation point is determined   1

from the condition $\left(\dfrac{\partial u}{\partial y}\right)_{y=0}$ _____ .

(h) Reynold number = _____ .   1

(i) The non dimensional quantity $\dfrac{V}{nd}$ is termed   1

as _____ .

(j) Minimum drag condition   1
C_{Lmd} = _____ .

2. (a) Describe the landmark stages and years in   5
the process of aircraft development. Give
examples.

(b) Define the following terms :   5

(i) aircraft   (ii) aerodynes

(iii) aerostat   (iv) helicopter

(v) hovercraft

3. Explain with neat sketches the variation in   10
pressure distribution with angle of attack over an
airfoil. What happens to pressure distribution at
stalling ?

4. (a) Explain the International Standard   5
Atmosphere (ISA) with neat diagram.

(b) What is stability of atmosphere ? Explain   **5**
the condition required to be met for stability
of atmosphere. Derive the equations
mathematically.

5. (a) The stall of swept wing tends to occur first   **5**
at tips, give reason.

(b) What are vortex generators ? Explain how   **5**
they help to prevent airflow separation.

6. List and explain the types of wind tunnels.   **10**

7. (a) Explain different types of propellers.   **5**

(b) Derive slip stream velocity equation.   **5**

8. A sailplane weighs 5000N has a wing area 7.5 m^2.   **10**
Its drag polar is given by $C_D = 0.10 + 0.02 C_L^2$.
During one of the flight it started gliding from
the height of 350 m in still air.

Determine :

(a) The greatest distance it can cover.

(b) The greatest duration of flight.

(c) Speed of flight in both cases.

9. Write short notes on following :   **10**

(a) Monocoque construction

(b) High lift devices

10. (a) Derive the Brequet equation for jet engine   5
aircraft.

(b) An aircraft weighs 3360000 N and is flying   5
at the condition where L/D = 10. What is
the thrust required ?

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