BAS-009

B. TECH (AEROSPACE ENGINEERING) (BTAE)
Term-End Examination
December, 2012

BAS-009 : INTRODUCTION TO AERONAUTICS

Time : 3 hours *Maximum Marks : 70*

Note :   Attempt any seven questions. All questions carry equal marks. Use of scientific calculator is permitted.

1. (a)   Describe the air foil nomenclature   5+5
   (b)   Define the following terms :
      (i)   Tapered wing.
      (ii)   Profile drag.
      (iii) Thrust - specific fuel consumption.
      (iv)   Combat range.
      (v)   Cruise propeller.

2. (a)   Explain in brief the trailing vortex system.   5+5
   (b)   How does down wash influence on the tailplane ?

3. (a)   What do you mean by airleron reversal speed ?   5+5
   (b)   Discuss the effect on Aerodynamic characteristics of change in "Aspect Ratio".

4. (a) What are the two important maneuvering flights and their essential requirements ?

   (b) Define the following : 5+5=10
       (i) TAS
       (ii) Aerodynamic centre
       (iii) Continuity equation
       (iv) Vortex
       (v) Super critical airfoil.

5. A jet plane which weights 29.43 kN and having 10 a wing area of 20 m^2 flies at a velocity of 950 km/hour, when the engine delivers 7357.5 kW power. 65% of the power is used to overcome the drag resistance of the wing. Calculate the Co - efficients of Lift and drag for the wing. The density of the atmospheric air is 1.21 kg/m^3.

6. At an airport in the tropics, the measured pressure 10 and temperature on a particular day are 737 mm of mercury and 40°C respectively. Calculate the density ρ and the relative density σ of the air.

7. On a certain day the pressure at sea level is 10 101500 N/m^2 and the temperature is 25°C. The temperature is found to fall linearly with height to −55°C at 11300 m, above which altitude, the temperature is constant. Calculate the pressure, density, and absolute and Kinematic coefficients of viscosity at (a) 10000 m, and (b) 11300 m.

8. The aeroplane is flying at an altitude where the ambient pressure is 30000 Nm^{-2} and the temperature is $-44.4°C$. Its true air speed is 270 ms^{-1}. Calculate the indicated air speed and compare the result with that obtained by neglecting compressibility.   **10**

9. Find the Mach Number when an aeroplane is flying at 1000 km/hr. through still air having pressure of 7 N/cm^2 and temperature of $-5°C$. Take R = 287.14 J/kg k.   **10**
   Calculate the pressure and temperature of air at stagnation point.
   take $\gamma = 1.4$

10. Write short notes on *any two* of the following :
    (a) Brequet range and endurance equation   **2x5=10**
    (b) Active and passive boundary layer control devices.
    (c) Types of wing platforms
    (d) Laminar and supercritical aerofoil.

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