BAS-009

B. TECH. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

June, 2014

00224

BAS-009 : INTRODUCTION TO AERONAUTICS

Time : 3 hours   *Maximum Marks : 70*

Note : (i)   Attempt *any seven* questions.

(ii)   All questions carry *equal* marks.

(iii)   Use of scientific calculator is *permitted*.

1.   Define the following :   5x2=10
     (a)   Aerodynamic Centre
     (b)   Stall velocity
     (c)   True Air Speed
     (d)   Wave drag
     (e)   Circulation

2.   (a)   Derive the expression for induced drag.   5+5
     (b)   Discuss the effect of 'Aspect Ratio' on 'Drag'.

3.   Enlist the various important parts of an aircraft   10
     and describe briefly about each of them.

4.   (a)   Explain 'Supercritical Airfoil' and its   5+5
           applications.
     (b)   Explain briefly the aerodynamics of a delta
           wing and its application.

5.   (a)   Derive the relation between velocity at   5+5
           minimum drag and velocity at minimum
           power.
     (b)   What are high lift devices ? Explain any two.

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6. Describe in detail the working principle of a Pitot   **10**
    tube with neat sketches.

7. (a) Differentiate between a piston engine and   **5+5**
         a jet engine.
    (b) Explain the significance of critical velocity
         in a V-n diagram.

8. Draw a 2-D airfoil with all the forces acting on it   **10**
    and then explain the various types of NACA
    nomenclature.

9. An aircraft has a wing area of 22.95 m^2 and a   **10**
    weight of 4536 kg and a clean drag polar of
    $C_D = 0.023 + 0.0735 C_L^2$, AR = 5.07
    Calculate :
    (a) $L|D|_{max}$
    (b) V_{Dmin} at sea level and at 12000 m
    (c) T_{min} for level flight
    Where, L is lift, D is drag, V_{Dmin} is velocity at
    minimum drag and T_{min} is the minimum thrust.