No. of Printed Pages : 2

BAS-009

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00495 **December, 2014**

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. Define the following terms : *5×2=10*

(i) Attitude of Aircraft

(ii) Induced Drag

(iii) Aspect Ratio

(iv) Downwash

(v) Sweepback

2. Explain in detail lift generation on an airfoil citing different theories put up by the scientists. *10*

3. (a) Explain the purpose of spoilers in an aircraft.

(b) Explain the functions of 'trim tabs' and 'flaps' in an aircraft. *5+5*

4. (a) Derive the expression for climb angle and rate of climb in an unaccelerated flight.

(b) Derive an expression for the radius of turn ('R') of an aircraft in terms of load factor (n) and velocity of an airplane (V). *5+5*

5. (a) What is 'wing warping' ? Why is it done ?

(b) Discuss the importance of ailerons, rudders and elevators in an airplane. *5+5*

6. (a) Explain 'static' and 'dynamic' stability of an aircraft.

(b) Explain the significance of neutral point in an aircraft. *5+5*

7. (a) Explain the principle behind hovering of a helicopter.

(b) Explain clearly the terms; 'yawing', 'pitching' and 'rolling' with the help of suitable sketches on a 3-D co-ordinate axes. *5+5*

8. Explain in detail the various layers of atmosphere, as per ISA. Also draw a labelled diagram. *10*

9. An aircraft has the following characteristics :

$C_D = 0{\cdot}025 + 0{\cdot}057\ C_L^2$

W = 13605 kg

S = 49·5 m^2

AR = 5

e = 0·895

Span = 15·732 m

The thrust at 3000 m altitude is constant at 3628 kg. Determine V_{max} at that altitude (3000 m). *10*