No. of Printed Pages : 4 **BAS-009**

B.TECH. (AEROSPACE ENGINEERING) PROGRAMME (BTAE)

Term-End Examination

December, 2011

00952

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 scientific calculator is **permitted**.*

1. Fill in the blanks :

(a) Geometric altitude is the physical altitude above _____ level. **1**

(b) Drag caused by the shear forces (viscous flow) is called _____ drag. **1**

(c) Airspeed can be measured by _____ tube. **1**

(d) Minimum power (P_{min}) occurs when parasite drag is _____ of induced drag. **1**

(e) _____ is the study of flow of gases around the solid bodies. **1**

(f) Vorticity is twice of _____ . **1**

(g) An airplane leaving ground effect will experience an increase in _____ drag. **1**

(h) _____ is the ratio of weight of fuel used per Newton of thrust per hour. 1

(i) Climb propeller has _____ pitch and _____ rpm. 1

(j) NACA stands for _____. 1

2. (a) What is the need to define ISA and give its values at standard sea level condition ? 5

(b) Distinguish between Troposphere and stratosphere. 5

3. (a) What causes "induced drag" ? 5

(b) Define skin friction drag and pressure drag. 5

4. (a) What are two important maneuvering flights and their essential requirements ? 5 5

(b) Define the following :

(i) TAS

(ii) Aerodynamic centre

(iii) Continuity equation

(iv) Vortex

(v) Super-critical airfoil

5. (a) Describe about NACA nomenclature. 5

(b) Distinguish between symmetrical airfoil and cambered airfoil. 5

6. (a) Define the following : 5

(i) Fowler flap

(ii) aspect ratio

(iii) vortex generator

(iv) advance ratio

(v) circulation

(b) An airscrew is required to produce a thrust of 4000 N at a flight speed of 120 m/s at sea level. If the diameter is 2.5m, estimate the minimum power which must be supplied on the basis of Froude's Momentum theory. 5

7. Compute thrust required to give a rate of climb of 25 m/s at 400 kph at sea level. ISA a condition for an airplane with following characteristic climb angle can be assumed to be small. 10

$W = 3500$ kg. , $S = 17\ m^2$,

$b = 10$ m, $C_{DO} = 0.02$, $e = 0.75$

8. (a) What is meant by aileron reversal speed ? 5

(b) Discuss effect on Aerodynamic characteristics of change in 'Aspect Ratio'. 5

9. An airplane has wing loading of 2400 N/m^2. The drag polar is given by $C_D = 0.016 + 0.055\ C_L^2$. Calculate its maximum (L/D), minimum drag speed (L/D) ratio at a speed of 100 m/s. 10

10. (a) List the structural component of aircraft and explain the functions associated with them. 5

(b) Discuss the features of the spoilers and their uses. 5