

00382

**B. Tech. AEROSPACE ENGINEERING
(BTAE)**

Term-End Examination

December, 2017

BAS-009 : INTRODUCTION TO AERONAUTICS

Time : 3 hours

Maximum Marks : 70

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- Note : (i) Attempt any seven questions.
(ii) All questions carry equal marks.
(iii) Use of scientific calculator is permitted.*
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1. Distinguish between fixed wing and rotary wing aircrafts. Classify aircrafts based on features and purpose. 4+6=10

2. Derive the expressions for temperature, pressure and density for gradient and isothermal atmospheric regions. Calculate pressure, temperature and density at an altitude of 13 km.
Given : Lapse rate = $- 6.5 \text{ k/km}$ 5+5=10

3. Write notes on the following : 5x2=10
 - (a) Different types of propellers.
 - (b) NACA 5-digit and 6-digit series.

4. Explain the following terms : 5x2=10
- (a) Geopotential altitude
 - (b) Aerodynamic center
 - (c) Absolute angle of attack
 - (d) Stalling
 - (e) Balanced field length
5. (a) Explain nomenclature of an unsymmetrical airfoil with the help of a neat labeled sketch. 5
- (b) Sketch the pressure distribution over a symmetrical airfoil at zero, low and high angles of attack. 5
6. Derive the expressions for calculating maximum range for a turbojet and turboprop aircraft. Also define range and endurance. 8+2=10
7. Derive an expression for total take-off distance. 10
8. Explain the following with the help of sketches :
- (a) Induced drag 3, 4, 3
 - (b) Drag polar for symmetrical and unsymmetrical airfoil section
 - (c) Primary control surfaces
9. (a) Explain V-n diagram for a typical fighter aircraft with the help of a neat labeled sketch. 5
- (b) Explain the working of a turbofan engine with the help of a neat and labeled diagram. 5
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