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Total No. of Printed Pages: 2

Total No. of Questions: [09]

**B. Tech (Aerospace Engg.) (Semester – 3<sup>rd</sup>)**

**BASICS OF AERONAUTICS**

**Subject Code: BASES1301**

**Paper ID: [19113002]**

**Time: 03 Hours**

**Maximum Marks: 60**

**Instruction for candidates:**

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

**Section – A**

**(2 marks each)**

Q1. Attempt the following:

- a) Discuss wings Fuselage Joining Methods.
- b) Define the centre of pressure.
- c) Write the different types of Under Carriages.
- d) Write about the Compressibility Correction.
- e) How to differentiate between finite and infinite wings?
- f) Define the induced drag.
- g) Differentiate between absolute and service Ceilings.
- h) Define the Static Margin.
- i) Differentiate between Ramjet and Rocket Engine.
- j) Write about the Instruments landing system.

**Section – B**

**(5 marks each)**

Q2. Derive the minimum thrust required condition for level, unaccelerated flight.

Q3. Explain the following,

- (i) Critical Mach number
- (ii) Drag divergence Mach number
- (iii) Compressibility correction factor
- (iv) Effect of aspect ratio.

Q4. Derive the condition for maximum rate of climb.

Q5. Explain about the Different Navigation Methods.

Q6. Explain the following:

- a) Turbojet engine
- b) Turbofan engine
- c) Turboprop engine
- d) Ramjet engine.

**Section – C**

**(10 marks each)**

- Q7. Consider a low-speed airplane flying at a velocity of 55m/sec. If the velocity at a point on the fuselage is 62m/sec, what is pressure coefficient at this point?
- Q8. Consider a wing with an aspect ratio of 10 and an NACA 23012 aerofoil section. Assume  $Re = 5 \times 10^6$ . The span efficiency factor  $e=0.95$ . If the wing is at a 40° angle of attack, Calculate  $C_L$  and  $C_D$ .  
(For the NACA 2412 Aerofoil  $C_L=1.2$  at  $\alpha = 10^\circ$  and  $C_L=0$  at  $\alpha = -2^\circ$  angle of attack and zero lift drag is 0.06)
- Q9. (a) Describe the criteria for longitudinal Static Stability.  
(b) Discuss and explain the Static Stability equations.