

USN

--	--	--	--	--	--	--	--	--	--

10AE45

**Fourth Semester B.E. Degree Examination, Dec.2014/Jan.2015**  
**Elements of Aeronautics**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART - A**

- 1 a. Define the following with equations and figure where ever it is needed:
- i) Aspect ratio                      ii) Mean aerodynamics chord                      iii) Wing sweep  
 iv) Anhedral / Dihedral      v) Decalage with respect to bi-plane  
 vi) Aerodynamic decalage with respect to mono-plane.                      (06 Marks)
- b. Discuss classification of airflow based on time dependance compressibility, viscosity, flow type and speed range.                      (07 Marks)
- c. What are the main components of air (structural and non structural) and give their specific functions?                      (07 Marks)
- 2 a. For the given plan-form find, i) L.E sweep                      ii)  $\frac{1}{4}$  C line sweep                      iii) Aspect ratio  
 iv) MAC                      v) x, y co-ordinates of  $\frac{1}{4}$  C of MAC.                      (10 Marks)

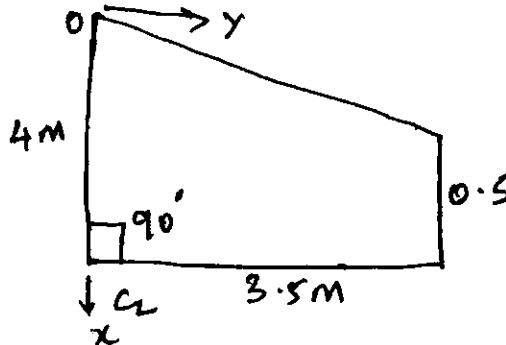


Fig. Q2 (a)

- b. Explain spoilers and all brakes and clearly explain their difference.                      (04 Marks)
- c. Describe the following NACA aerofoils:
- i) NACA 2415                      ii) NACA 23012                      iii) NACA 632-218                      (06 Marks)
- a. Define Mach number, speed of sound and Reynolds number with the aid of equations.                      (06 Marks)
- b. Derive the relationship between pressure density and temperature (given pressure, density and temperature at initial altitude) at any altitude in the temperature gradient layer in atmosphere.                      (06 Marks)
- c. If an airplane is flying at an altitude where actual pressure and temperature are  $4.72 \times 10^4 \text{ N/m}^2$  and 255.7 K respectively. What are the pressure, temperature and density altitudes?                      (08 Marks)

- 4 a. State Keplers 3 laws of orbit motion with figures and equations where ever needed. (08 Marks)
- b. Explain the concept of stability, static stability and dynamic stability with the help of figures and graphs. (06 Marks)
- c. A Balvon has a mass of 10 kg and volume  $16 \text{ m}^3$ . Find the maximum altitude it can reach under ISA conditions. (06 Marks)

**PART – B**

- 5 a. How are aircraft structure design considerations different from civil/mechanical static structures? (08 Marks)
- b. Explain : i) MonoCoque                      ii) Semi-monoCoque                      iii) Geodesic construction  
iv) Integrally milled skin. (04 Marks)
- c. Describe the type of loads imposed on structure, giving aerodynamic load distribution on fuselage and wing. (08 Marks)
- 6 a. What are the factors to be considered while selecting a power plant for an aircraft? (05 Marks)
- b. Describe the following types of engines with schematic diagram:  
i) Turbojet engine                      ii) Turbofan engine                      iii) Turbo prop (15 Marks)
- 7 a. What is meant by system? What are the functions of aircraft system? List the systems required for an aircraft. (09 Marks)
- b. Describe the working of a typical aircraft hydraulic system. (06 Marks)
- c. In a 50 mm diameter pipe oil flows at the rate of  $0.2 \text{ m}^3$  per minute. Find the velocity of oil in the pipe. (05 Marks)
- 8 Write short notes on any five:  
a. Altimeter  
b. Turn co-ordinator  
c. Air speed indicator  
d. Communication system  
e. Navigation aids  
f. Weather system (20 Marks)

\*\*\*\*\*