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10AE45

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
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:
i) Aspect ratio; ii) Mean aerodynamic 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 dependence, 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 coordinates of $\frac{1}{4}$ C of MAC. **(10 Marks)**

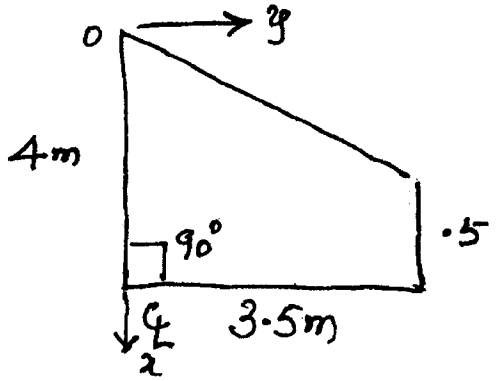

Fig.Q.2(a)

b. Explain spoilers and airbrakes 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)**

3 a. Define Mach number, Speed of sound and Reynold's 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 4.72×10^4 N/m^2 and 255.7K respectively, what are the pressure, temperature and density altitudes? **(08 Marks)**

4 a. State Kepler's 3 laws of orbit motion with figures and equations wherever 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 Balloon has a mass of 10kg and volume $16m^3$. Find the maximum altitude it can reach under ISA conditions. **(06 Marks)**

PART – B

5 a. How are aircraft structure design considerations are 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 type of engines with schematic diagram: i) Turbojet engine; ii) Turbo fan 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 with sketch. **(06 Marks)**

c. In a 50mm dia pipe oil flows at the rate of 0.2 m^3 per minute. Find the velocity of oil in the pipe. **(05 Marks)**

8 Write short notes on any five:
i) Altimeter; ii) Turn co-ordinator; iii) Air speed indicator; iv) Communication system; v) Navigation aids; vi) Weather system. **(20 Marks)**

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