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Third Semester B.E. Degree Examination, Feb./Mar. 2022
Elements of Aeronautics

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define standard atmosphere. Find the standard atmospheric values of density, temperature and pressure at a geo-potential altitude of 15km.   (10 Marks)
   b. Draw neat sketch of typical aircraft and explain its components. Also explain function of each part.   (10 Marks)

OR

2 a. Draw and explain about general types of construction for a fuselage of an aircraft. (10 Marks)
   b. Explain about high lift devices with neat sketch.   (06 Marks)
   c. Write about application of metallic and non-metallic materials in air crafts.   (04 Marks)

Module-2

3 a. Derive Bernoullis equation for an ideal flow.   (08 Marks)
   b. An aircraft with a wing surface area of $16m^2$ and span length of 8m, generating a lift of 8000kg. For a flight velocity of 120m/s at standard sea level, calculate co-efficient of lift, induced drag co-efficient and induced drag. Assume density = $1.225kg/m^3$, e = 0.8.
                                                                                           (08 Marks)
   c. Draw an airfoil and explain its nomenclature.   (04 Marks)

OR

4 a. Define the following terms with neat sketch :
      i)   Aerodynamic centre
      ii) Center of pressure
      iii) Aspect ratio
      iv) Pressure co-efficient.   (08 Marks)
   b. Write about types of drag.   (06 Marks)
   c. An aircraft is flying at 30.5m/s at sea-level condition. If pressure at a point on the wing is $1.01 \times 10^5 N/m^2$. Find the pressure co-efficient. Also find the pressure coefficient at same point on wing if free –stream mach number is increased to 0.6.   (06 Marks)

Module-3

5 a. With neat sketch, explain the operation of Turbojet engine with PV and TS diagram.
                                                                                           (10 Marks)
   b. Explain about RamJet and ScramJet engine with necessary sketch and graph.   (10 Marks)

OR

6 a. Compare the merits and demerits of TurboJet and Turbofan engines.   (10 Marks)
   b. Explain about principles of thrust augmentation and methods.   (10 Marks)

Module-4

7 a. Explain the difference between static and dynamic stability. **(08 Marks)**
   b. Explain the criteria for longitudinal static stability with the illustration of static stability and Static Instability. **(12 Marks)**

OR

8 a. Draw and explain about power available and power required curves with maximum velocity for propeller driven and Jet propelled airplane. **(10 Marks)**
   b. Draw and explain about changes in altitude and its effects on power required and maximum velocity. **(10 Marks)**

Module-5

9 a. Draw and explain about typical pneumatic system of an aircraft. **(10 Marks)**
   b. Draw and explain about hydraulic system used in aircraft with neat sketch. **(10 Marks)**

OR

10 a. Explain about communication and navigation systems used on aircrafts. **(10 Marks)**
   b. Explain about primary and secondary controls used in cockpit. **(10 Marks)**

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