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C 3011

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Third Semester

Aeronautical Engineering

AE 1203 — ELEMENTS OF AERONAUTICS

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are high lift devices? What has prompted their development?
2. What is the basic difference between a hot air balloon and an aircraft?
3. What is equivalent air speed? How is it related to true air speed?
4. What are the functions of ailerons in an aircraft?
5. Define Troposphere and temperature lapse rate.
6. Define aerodynamic centre.
7. Enumerate the stiffener shapes used in aircraft fuselage shell.
8. What are the main advantages and disadvantages of composite materials for aircraft structures?
9. State the propellant burning configurations possible in solid propellant motors.
10. What are hypergolic propellants? Give an example.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the advantages and disadvantages of monoplanes compared to biplanes? (6)
- (ii) Explain why swept back wing concept has been developed. (5)
- (iii) Discuss the advantages of carry through structures connecting cantilever wings. (5)

Or

- (b) Describe a Ramjet engine and compare its working principle with SCRAMJET and turbojet engines. (16)
12. (a) Describe the major components of an aeroplane with a neat sketch and explain their functions. (16)

Or

- (b) (i) Enumerate the basic instruments used for flying. (4)
- (ii) Describe the flight instruments measuring ATTITUDE of an aircraft. (12)
13. (a) (i) Discuss the temperature variation with altitude of standard atmosphere and classify the atmospheric layers. (6)
- (ii) Derive the expressions relating the standard atmosphere values of pressure, density and temperature at any altitude in the troposphere with that of sea level values. (10)

Or

- (b) (i) Describe an aerofoil and explain its nomenclature. (5)
- (ii) Define centre of pressure, coefficient of pressure and Mach number. (6)
- (iii) Express lift and drag of an aerofoil in terms of normal and axial forces. (5)
14. (a) Explain how aeroplane wings are constructed and indicate the choice of materials for the main components. (16)

Or

- (b) (i) Write a short note on composite materials and their applications to aircraft construction. (5)
- (ii) Discuss briefly the choice of material for aircraft engine components. (5)
- (iii) Discuss the need for Alclad aluminium alloys for aircraft structures. (6)

15. (a) (i) With a neat sketch explain the principle of operation of a turbo prop engine. (10)
- (ii) What is a cryogenic rocket engine? Explain. (6)

Or

- (b) (i) Thrust produced by an aircraft engine is best explained by Newton's third law of motion. True/False? Justify your answer. (4)
- (ii) Define propeller efficiency. (2)
- (iii) Describe a turbofan engine with a neat sketch and explain why the efficiency of this engine is better than a turbojet engine. (10)
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