



Reg. No. :

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

**Question Paper Code : X10041**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2021

Sixth Semester

Aeronautical Engineering

AE 8604 – AIRCRAFT DESIGN

(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. How the aircraft conceptual design was developed ?
2. Name four performance specifications of a fighter aircraft.
3. In an aircraft mission why is reserve fuel necessary ?
4. Relate stalling speed and wing loading in constant density atmosphere.
5. List the different types of aircraft engines available for speeds between Mach 2 to 4.
6. Which of the following are not advantages of higher thrust/weight ?  
(higher rate of turn/higher rate of climb/longer runway length/lower drag)
7. Low-wing aircrafts generally are given dihedral wing configuration. What is the dihedral primarily used for ?
8. In low speed aircraft state the primary purpose of leading edge sweep.
9. State the main function(s) of the horizontal tail of a typical aircraft.
10. How are the functions of elevator and aileron performed in a tailless aircraft ?



PART – B

**(5×13=65 Marks)**

11. a) i) Explain classification of aircraft based on purpose and configuration. Give examples in each category. (5)  
ii) Discuss design aspects of an aircraft with respect to manufacturability and maintenance. (4)  
iii) Differentiate between the fail-safe and safe life design concept. (4)

(OR)

- b) i) Compare merits and demerits between high wing and low wing configuration. (5)  
ii) What are the different stages in aircraft design ? Explain the various studies and calculations carried out and performed in each stage. (8)

12. a) i) Describe a typical mission profile for a long-range civilian transport aircraft. (5)  
ii) List the importance of data collection and 3-view drawings in aircraft preliminary design. (4)  
iii) Explain why the center of gravity location of an aircraft is important in the preliminary design stage. (4)

(OR)

- b) How is the total weight of an aircraft broken up into components ? What is the importance of weight fractions in aircraft design ? For a long-range civilian transport aircraft, list typical values/range of values for the different weight fractions. Name a few materials used for modern aircraft construction and compare their strength to weight ratios.

13. a) Describe the operating principle of a piston engine. What is the effect of flight speed and altitude on the output of a piston engine ? Explain piston engine performance characteristics. For what aircraft type should you recommend a piston engine ?

(OR)

- b) Write an essay about thrust loading optimization of an aircraft. What are the different types of power plants for an aircraft ? Explain the basis of engine selection for an aircraft.

14. a) Give an explanation of the following topics :  
• significance of the Reynold's number in aircraft design. (4)  
• selection of aerofoil parameters for a subsonic aircraft. (5)  
• aerofoil selection for supersonic aircraft. (4)

(OR)

- b) Explain airworthiness requirements of an aircraft and give examples. How is the V-n diagram of an aircraft constructed and what is its purpose ?



15. a) i) Define the static margin of an aircraft and explain its role in aircraft design. **(5)**
- ii) Write about aircraft lateral stability and explain design requirements for adequate lateral stability. What is rudder lock ? Explain vertical tail sizing of an aircraft with respect to lateral stability. **(8)**

(OR)

- b) List the main parts of an aircraft landing gear. What are different types of loads an aircraft landing gear is subject to and how are these loads resisted ? Name a few different types of shock absorber mechanisms for an aircraft landing gear.

PART – C

**(1×15=15 Marks)**

16. a) i) Name the structural components of an aircraft wing and explain their functions. **(6)**
- ii) When does sustained turn rate become important ? How do we design an aircraft to achieve a specified turn rate ? **(6)**
- iii) Explain the importance of computer aided aircraft design. **(3)**

(OR)

- b) Explain in detail the determination of wing loading with respect to any **THREE** of the following considerations :
- i) wing loading based on the absolute ceiling of the aircraft. **(3)**
- ii) wing loading based on specified acceleration. **(4)**
- iii) wing loading based on the range of the aircraft, and **(4)**
- iv) wing loading selection based on landing performance. **(4)**
-