ANNA UNIVERSITY – 2007

B.E/B.TECH MODEL EXAMINATION

AIRCRAFT PERFORMANCE

(AERONAUTICAL ENGINEERING)

TIME-3HOUR
MARK-100

ANSWER ALL QUESTIONS

PART - A (10 X 2 = 20 MARKS)

1. For a bluff body skin friction drag is more than pressure drag. True/ false. Justify your answer.

2. Two identical airfoils are kept in identical flow conditions. The surface of one Airfoil is relatively more rough. This airfoil will have higher stalling angle than the other. True/ False. Justify your answer.

3. Explain why induced drag of a finite wing is more than that of an infinite wing.

4. What is the effect of Reynolds number on skin friction drag?

5. Plot the variation of Thrust required with flight velocity in steady level flight and give a brief explanation.

6. Explain the terms Absolute Ceiling and Service Ceiling?

7. Define the tem Specific Air Range?

8. What is the role of spoilers during landing of an aircraft?

9. Explain how load factor is related to the bank angle.

10 Why propeller blades are given a geometric. Twist from root to tip?

PART - B (5 X 16 = 80 MARKS)

11. An aircraft is in steady level flight at sea level at speed of 100 m/s. The pilot causes his aircraft to enter a horizontal, correctly banked circle of l100 m radius keeping the same angle of incidence. The engine thrust is altered as necessary. Then the pilot brings the aircraft out of the turn without altering the angle of incidence and thrust and allows it to climb. Estimate the rate of climb, if at that incidence, the L/D ratio is 8.

12.a)i) An aircraft is flying at m times the speed corresponding to minimum drag in steady level flight. Show that, = (m2 + m-2) Where D is the drag on the aircraft at the flight speed and Dmin is the minimum drag.

ii) Write a brief note on Drag reduction of Airplanes.

OR

12.b)i) An aircraft is flying in steady level flight at ? times its minimum power speed. Show that = where P is the power required at the flight speed and Pmin is the minimum power required.

ii) Write a brief note on Airfoil characteristics.

13.a) Write short notes on :

i. Glide Hodograph

ii. V- ? Diagram

iii. Minimum time to climb

OR

13.b)i) Show that for steep angles of climb ?, P/Po = (1+ tan ?) cos3/2 ? Where P is thrust power used for climb and Po is the power required for steady level flight at same incidence and altitude.

ii) For steep angle of glide show that the rate of descent (sinking speed) is given by Where W is the weight of the aircraft, ? is density of air and S is Planform area of wing.

14.a)i) Derive the Brequette Range formula for Jet-Propelled airplanes.

ii) Discuss some methods of thrust augmentation

iii) Write a brief note on high lift devices

OR

14.b)i) Define Take off distance and derive a suitable formula for estimating the same.

ii) Discuss the factors affecting the endurance of a Propeller-driven airplane.

iii) Explain briefly what is thrust reversal.

15.a) For level turn, show that the minimum turn radius (Rmin) is given by Where is using loading, T/W is thrust to weight ratio, CDo is profile drag at zero lift and k = .

OR

15.b)i) An airscrew is required to produce a thrust of 4000N at a flight speed of 120 m/s at sea level. If the diameter is 2.5 m, estimate the minimum power which must be supplied based on Froude's Momentum theory of Propulsion.

ii) Write a brief note on variable pitch propeller

iii) What is activity factor of an airscrew?