B.E.(Aeronautical Engineering) Semester Fifth (C.B.S.)

Aerodynamics - II Paper - III

P. Pages : 2 **KNT/KW/16/7372**

Time : Three Hours * 0 6 8 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.
12. Take sea level air density as 1.2256 kg/m^3.

1. a) Why are the aerodynamic characteristics of a finite wing different from the properties of its aerofoil Sections. Explain it with neat diagram. **5**

b) What are the general features of finite-wing aerodynamics? and also explain the tools needed for finite wing analysis with diagram. **6**

c) What is downwash? Explain it. **3**

OR

2. a) State the Helmholtz vortex theorems. **3**

b) Differentiate between the 'flow over an airfoil' and the flow over a finite wing. **3**

c) Describe the momentum theory of wing for lift and induced drag. **8**

3. a) Applying Bio-Savart Law to a straight vortex filament of semi-infinite length, calculate the induced velocity. **8**

b) Explain in brief the effect of twist for a given wing platform with neat and well labelled diagram. **5**

OR

4. a) Calculate the Induced angle of attack in terms of the circulation distribution $\Gamma(y)$ along the wing using Prandtl lifting line theory. **8**

b) What do you mean by Horse - Shoe vortex? How the wing can be replaced by the horse-shoe vortex? **5**

5. a) Consider a finite wing with aspect ratio of 8 and lift slope = 0.0867/degree. The airfoil Section is thin and symmetric. calculate the lift and Induce drag coefficients for the wing when it is at an angle of attack 5 degree **6**

b) Compare between high and low aspect ratio wings. **3**

c) Write a short note on wing tip devices. **4**

OR

6. a) Explain briefly Drag and moment characteristics of complete airplane. **7**

b) How swept back wing configuration affect aerodynamic performance of an aircraft? Explain with neat diagram. **6**

7. a) Derive non-linear velocity potential equation. Extend it to perturbation velocity potential equation. **9**

b) Write a short notes on Ackert's supersonic airfoil theory. **5**

OR

8. a) Using Shock expansion theory, calculate the lift and drag coefficients for a flat plate at $\alpha = 7^{o}$ in Mach 2.5 flow. **8**

b) Write a short notes on Prandtl-Glaurett compressibility corrections. **6**

9. Enlist Various types of wind Tunnels. Explain briefly any one type of wind tunnel and its working principle with neat sketch. **13**

OR

10. Write short notes on the following. **13**

a) Interference effects in supersonic wind tunnel.

b) Shock Tunnels

c) Model Testing in wind tunnel.

11. Explain briefly the types of Visualization method for subsonic and supersonic flows with neat sketches. **13**

OR

12. a) How static pressure is measured inside the wind tunnel. **5**

b) What are the differences between shock tubes and shock tunnels. **4**

c) Write short Notes on free flight Testing. **4**

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