

POF  
FINAL EXAMINATION  
FLD 24

1. Which of the following wing planforms produces the lowest induced drag?( All other relevant factors constant.)
  - a. Tapered
  - b. rectangular
  - c. elliptical
  - d. circular
  
2. winglets :
  - a. increase manoeuvrability
  - b. create elliptical lift distribution
  - c. decrease the induced drag
  - d. Decrease the static lateral stability
  
3. A laminar boundary layer is a layer ,in which:
  - a. The velocity is constant
  - b. The vortices are weak
  - c. The temperatures varies constantly
  - d. No velocity component exist, normal to the surface
  
4. Which of the following situation leads to a decreasing stall speed (IAS).
  - a. Increasing Load factor
  - b. Increasing air density
  - c. Decreasing weight
  - d. Increasing altitude
  
5. The angle of attack of a wing profile is defined as the angle between:
  - a. The local airflow and the chord line
  - b. The undisturbed airflow and the mean camber line
  - c. The undisturbed airflow and the chord line
  - d. The local airflow and the mean camber line
  
6. Two identical aircraft **A** and **B** ,with the same mass, are flying steady level co-ordinated 20 degree bank turns .if the TAS of **A** is 130 kts and that of **B** is 200kts.
  - a. The lift coefficient of **A** is less than that of **B**
  - b. The Turn radius of **A** is greater than of **B**
  - c. The Load factor of **A** IS greater than that of **B**
  - d. The rate of turn of **A** IS greater than that of **B**
  
7. Wing loading is:
  - a. The ratio of lift to aircraft
  - b. The ratio of wing weight to wing area
  - c. The ratio of total aircraft weight to wing area
  - d. The ratio of lift to drag
  
8. which one of the following statements bout Bernoulli's theorem is correct
  - a. The dynamic pressure is maximum in stagnation point]
  - b. The pressure decreases as static pressure decreases

- c. The total pressure is zero when the velocity of the stream is zero
  - d. The dynamic pressure increases as static pressure decreases
9. In a two dimensional flow pattern ,where the streamline converge the static pressure will be:
- a. not change
  - b. increase
  - c. decrease
  - d. increase initially, the decrease
10. The taper ratio is:
- a. the ratio of root incidence to tip incidence
  - b. the ratio of root thickness to tip thickness
  - c. the ratio of tip chord length to root chord length
  - d. ratio of dihedral angle to root chord length
11. Drag is in the direction of –and lift is perpendicular to the:
- a. chord line
  - b. longitudinal axis
  - c. horizon
  - d. relative wind/airflow
12. The difference between IAS and TAS will :
- a. Increase with decreasing temperature
  - b. Decrease with decreasing altitude
  - c. Increase with increasing air density
  - d. Decrease with increasing speed
13. When a pilot makes a turn in horizontal flight ,the stall speed.
- a. Increase with flap extension
  - b. Decrease with increasing bank angle
  - c. Increase with the square root of the load factor
  - d. Increase with the load factor squared
14. When flaps are extended in straight and level flight at a constant IAS ,the lift coefficient will eventually:
- a. decrease
  - b. increase
  - c. remain the same
  - d. first increase and then decrease
15. When the aircraft is in straight and level flight the normal axis is:
- a. Horizontal
  - b. Vertical

- c. *Wing tip to wing tip*
  - d. *longitudinal*
16. Which of the following statement, about a venturi in a sub –sonic airflow are correct?  
 1. the dynamic pressure in the undisturbed flow and in the throat are equal. 2. The total pressure in the undisturbed flow and the in the throat are equal
- a. *1 is incorrect and 2 is correct*
  - b. *1 and 2 are correct*
  - c. *1 is correct and 2 is incorrect*
  - d. *1 and 2 are incorrect*
17. If the indicated airspeed of an aircraft is increased from 80kts to 160kts, parasite drag will be:
- a. Four times greater
  - b. Six times greater
  - c. One quarter as much
  - d. Half as much
18. An aircraft whose weight is 237,402N stalls at 132kts ,At a weight of 356,103N it would stall at :
- a. 162kts
  - b. 88kts
  - c. 172kts
  - d. 108kts
19. The following factors increase stall speed.
- a. Lower weight ,decreasing bank angle ,a smaller flap setting.
  - b. An increase in load factor, a forward C.G. shift, decrease in thrust.
  - c. Increasing bank angle , increasing thrust ,slat extension.
  - d. A higher weight, selecting a higher flap setting, a forward C.G shift
20. The aircraft drag in straight and level flight is lowest when the :
- a. Induced drag is lowest
  - b. Induced drag is equal to zero
  - c. Parasite drag equals twice the induced drag
  - d. Parasite drag is equal to induced drag
21. With increasing angle of attack, the stagnation point will move (i).....and the point of lowest pressure will move(ii).....respectively (i ) and n(ii) are:
- a. (i) down, (ii) forward
  - b. (i) up, (ii) aft

- c. (i)down, (ii)aft
  - d. (i) up,(ii) forward
22. The resistance ,or skin friction, due to viscosity of air as it passes along the surface of a wing is a type of::
- a. Interference drag
  - b. Form drag
  - c. Parasite drag
  - d. Induced drag
23. In order to maintain straight and level flight at a constant air speed ,whilst the flaps are being retracted, the angle of attack must be :
- a. increased
  - b. decreased
  - c. held constant
  - d. increased or decreased depending upon the type of flap
24. When the angle of attack of a symmetrical aerofoil is increased, the centre of pressure will:
- a. Have very limited movement
  - b. Is unaffected
  - c. Move forward to the leading
  - d. Move aft along the aerofoil
25. How is the stall warning presented to the pilot s of a large transport aircraft?
- a. Stall warning light only
  - b. Stick shaker and/or aerodynamic buffet
  - c. Aural warning only
  - d. Stick pusher
26. The angle of attack of an aerofoil section directly controls:
- a. Amount of airflow above and below the section
  - b. Angle of incidence of the section
  - c. Distribution of positive and negative pressure acting on the section
  - d. The angle relative to the horizontal datum
27. At zero angle of attack, the pressure along the upper surface of a symmetrical aerofoil section would be:
- a. Greater than atmospheric pressure
  - b. Equal to atmospheric pressure
  - c. Less than atmospheric pressure
  - d. Non existent

28. To maintain altitude, what must be done as indicated airspeed(IAS)is reduced:
- Decrease angle of attack to reduce the drag
  - Increase angle of attack to maintain the correct lift force
  - Deploy the speed brakes to increase drag
  - Reduce thrust
29. The purpose of leading edge droop is:
- To give a more cambered section for high speed flight
  - To increase the wing area for takeoff and landing
  - To increase wing camber, and delay separation of the airflow when trailing edge flaps are lowered
  - To decrease the lift during the landing run
30. If more lift force is required because of greater operating weight, what must be done to fly at the angle of attack which corresponds to CLMAX:
- Increase the angle of attack
  - Nothing, the angle of attack for CLMAX is constant
  - Increase the indicated airspeed(IAS)
  - It is impossible to fly at the angle that corresponds to CLMAX
31. Bernoulli's theorem states:
- Dynamic pressure increase, Static pressure increase
  - Dynamic pressure increase, Static pressure decrease
  - Dynamic pressure is maximum at stagnation point
  - Zero pressure at Zero dynamic pressure.
32. With flaps lowered ,the stalling speed will:
- Increase
  - Decrease
  - Increase ,but occurs at a higher angle of attack
  - Remain the same
33. A symmetrical aerofoil at CL=0 will produce?
- A negative (nose down) pitching moment
  - A positive(nose up) pitching moment
  - Zero pitching moment
  - No aerodynamic Force.
34. *The movement of an aircraft is defined along three axes which all pass through;*
- the centre of pressure*
  - the centre of gravity*
  - the intersection of the centerlines of the fuselage and wings*

*d. the intersection of the normal vertical*

35. Which of the following decreases induced Drag?

- a. wing fences
- b. Anhedral
- c. Winglets
- d. Low aspect ratio plan form

36. Bernoulli's law state:

Rho: is the mean sea level density under ISA conditions

Pstat: is static pressure

Pdyn: is dynamic pressure

Ptot : is total pressure

- a.  $P_{dyn} + 1/2\rho v^2 = \text{constant}$
- b.  $P_{tot} + 1/2\rho v^2 = p_{stat}$
- c.  $P_{stat} + 1/2\rho v^2 = \text{constant}$
- d.  $P_{stat} + 1/2\rho TAS^2 = \text{constant}$

37. By what percentage does the lift increase in level turn at 45° angle of bank, compared to straight and level flight?

- a. 31%
- b. 19%
- c. 41%
- d. 75%

*38. In a stationery subsonic streamline flow pattern, if streamline converge, in this part of the pattern, the static pressure(I) will....and the velocity(II) Will...:*

- a. (i)decrease (ii)increase*
- b. Increase (ii) increase*
- c. Increase(ii)decrease*
- d. Decrease (ii)decrease*

39. A 50 twin engine aeroplane performs a straight, steady, wings level climb. If the lift/drag ratio is 12 and the thrust is 60,000N per engine ,the climb gradient is:

- a. 24%
- b. 3.7%
- c. 15.7%
- d. 12%

40. Rolling is the rotation of the aircraft about the :

- a. Vertical axis
- b. Wing axis
- c. Longitudinal axis

d. Lateral axis

41. Consider a certain streamline tube .the velocity of streamline in the tube is  $V$ . an increase of temperature of the stream at constant value of  $v$  will:
- Increase the mass flow when the tube is divergent in the direction of flow
  - Increase the mass flow
  - Not affect the mass flow
  - Decrease the mass flow
42. Which one of the following statements bout Bernoulli's theorem is correct
- The dynamic pressure is maximum in stagnation point]
  - The pressure decreases as static pressure decreases
  - The total pressure is zero when the velocity of the stream is zero
  - The dynamic pressure increases as static pressure decreases
43. How is stall warning presented to the pilots of a large transport aircraft?
- Stick pusher
  - Stall warning light only
  - Aural warning only
  - Stick shaker and/or aerodynamic buffet
44. Excluding constants ,the coefficient of induced drag( $C_{Di}$ ) is the ratio of:
- $C_L$  and  $C_D$
  - $C_L$  and  $b$ (wing span)
  - $C_L^2$  and  $AR$ (aspect ratio)
  - $C_L^2$  and  $S$  (wing surface)
45. A high aspect ratio wing produces:
- An increase in induced drag
  - A decrease in stall speed
  - A decrease in induced drag
  - A decrease in indicated airspeed
46. Which statement is correct at the speed for minimum drag(subsonic)?!
- Induced drag is greater than the parasite drag
  - The gliding angle is minimum(assume zero thrust)
  - The  $C_L/C_D$  ratio is minimum(assume zero thrust)
  - Propeller aircraft fly at speed at maximum endurance
47. As bank angle is increased in a turn at a constant IAS , the load factor will:
- Remain the same
  - Decrease
  - Increase at an increasing rate
  - Increase in direct proportional to bank angle

48. A wing which is inclined downwards from root to tip is said to have :
- Anhedral
  - Sweep
  - Taper
  - Wash out
49. When the angle of attack of a positively cambered aerofoil is increased, the centre of pressure will:
- Have very little movement
  - Move forward along the chord line
  - Remain unaffected
  - Move back along the chord
50. VA
- The maximum speed at which rolls are allowed Wingspan
  - The speed that should not be exceeded in climb
  - The speed at which a heavy transport should fly in turbulence
  - The maximum speed at which maximum elevator deflection up is allowed

**PART 2 (20mks)**

**Answer any Two Questions**

1. (a) Define the following terms
- Relative humidity
  - Air Viscosity
  - Altitude
  - QFE
  - QNE
- (10 mks)
- (b) Explain the following speeds
- IAS
  - CAS
  - TAS
  - RAS
  - GS
- (10 mks)
2. Describe the atmosphere from the troposphere to the ionosphere taking into account the temperature, pressure and air density changes. (20 mks)
3. (a) Explain the term interference drag. How it is minimized? (5 mks)



- (b) Induced drag is drag due to lift. Explain that statement and explain how induced drag is minimized. (15 mks)
4. (a) List and explain the factors affecting Longitudinal stability (10 mks)  
 (b) Explain the advantages of a canard configuration (10 mks)
5. (a) Compute the aircraft velocity required to provide lift for an aircraft given the following parameters  
 • Aircraft mass: 60,000kg  
 • Wing area: 225square meters  
 • Coefficient of Lift: 0.608  
 • Density of Air: 1.225 kg/m<sup>3</sup>  
 • Accerelation due to gravity constant: 9.81m/sec<sup>2</sup>  
 (6 Mks)
- (b) List the ICAO standard atmosphere assumption (4mks)  
 (c) Consider air flowing at 300kts with a density of 1.068kg/m<sup>3</sup>, what will be the dynamic . . (5mks)  
 (d) Given the following details calculate the lift force that will be generated by a wing with these specifications  
 Air density: 1.105kg/m<sup>3</sup>  
 Surface area: 115metres  
 TAS: 250KTS  
 Aerodynamic lift co-oefficient: 0.008  
 w(5mk)