



# EAST AFRICAN SCHOOL OF AVIATION EXAMINATION

## FINAL EXAM

### IATA/SAFETY SECTION

### SUBJECT: PRINCIPLES OF FLIGHT

Stream: Flight Dispatch No.21

Duration: 2 Hrs

DATE: 20/09/2016

TIME: 8.30 – 10.30 AM

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#### INSTRUCTIONS TO CANDIDATE:

1. *This paper consists of **NINE (9)** Printed pages.*
2. *This paper consists of **TWO SECTIONS***
3. Answer the questions as per the instructions given
4. Examination rules and regulations shall apply

**PART 1**

1. what changes to the aircraft control must be made to maintain altitude while the airspeed is being decreased:
  - a. increase angle of attack to produce more lift than weight
  - b. Increase the angle of attack to compensate for the decreasing dynamic pressure.
  - c. Decrease the angle of attack to compensate for the decrease in drag
  - d. Maintain a constant angle of attack until the desired airspeed is reached, then increase the angle of attack.
2. Take –off from an airfield with a low density altitude will result in:
  - a. A longer take off run
  - b. A higher than standard IAS before lift off
  - c. A higher TAS for the same lift off IAS
  - d. A shorter take off run because of lower TAS required for the same IAS.

3. Given that:

Aircraft A      -Wing span: 51m; Average wing chord: 4m

Aircraft B      - Wingspan: 48m; Average chord: 3.5m

Determine the correct aspect ratio and the wing area.

- a. Aircraft **A** has an aspect ratio of 13.7 and has a larger wing area than aircraft **B**
  - b. Aircraft **B** has an aspect ratio of 13.7 and has a smaller wing area than aircraft **A**
  - c. Aircraft **B** has an aspect ratio of 12.75 and has a smaller wing area than aircraft **A**
  - d. Aircraft **A** has an aspect ratio of 12.75 and has a smaller wing area than aircraft **B**
4. Aspect ratio of the wing is defined as the ratio of the :
    - a. Wingspan to the wing root
    - b. Square of the chord to the wing span
    - c. Square of the wing to the span
    - d. Wing span to average chord
  5. Which statement is true relative to changing angle of attack:
    - a. An increase in angle of attack will decrease lift coefficient
    - b. An increase in angle of attack will increase drag
    - c. An increase in angle of attack will decrease pressure below the wing and increase drag

- d. An increase in angle of attack will increase pressure below the wing and increase drag.
6. At a given indicated airspeed, what effect will an increase in air density have on lift and drag:
- Lift will increase but drag will decrease
  - Lift and drag will increase
  - Lift and drag will decrease
  - Lift and drag will remain the same
7. In a stationary subsonic streamline flow pattern, if streamlines converge, in this part of the pattern, the static pressure(I) will....and the velocity(II) Will...:
- (i)decrease (ii)increase
  - Increase (ii) increase
  - Increase(ii)decrease
  - Decrease (ii)decrease
8. Which statement with respect to the speed of sound is correct?
- increases always if the density of the air decreases.
  - doubles if the temperature increases from 9° to 36° centigrade.
  - is independent of altitude
  - varies with the square root of the absolute temperature.
9. Comparing the lift coefficient and drag coefficient at normal angle of attack:
- CL is much lower than CD
  - CL is lower than CD
  - CL is much higher than CD
  - CL is approximately the same value as CD
10. The (subsonic) static pressure:
- Is the total pressure plus the dynamic pressure.
  - Is the pressure in a point at which the velocity has become zero.
  - Increases in a flow in a tube when the diameter decreases.
  - Decreases in a flow in a tube when the diameter decreases.
11. The location of the Centre of pressure of a positive cambered wing at increasing angle of attack will:
- Not shift
  - Shift aft
  - Shift forward
  - Shift in span wise direction
12. The angle of attack of a wing profile is defined as the angle between:
- The local airflow and the chord line
  - 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
13. Which of the following airplane parts affect induced drag most?
- a. Wing root junction.
  - b. Landing gear.
  - c. Engine cowling.
  - d. Wing tip.
14. Directional control is provided by:
- a. The rudder
  - b. The elevators
  - c. The ailerons
  - d. Landing gears
15. 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
16. which one of the following statements about 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
17. 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
18. 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

19. Drag is in the direction of –and lift is perpendicular to the:
- chord line
  - longitudinal axis
  - horizon
  - relative wind/airflow
20. The difference between IAS and TAS will :
- Increase with decreasing temperature
  - Decrease with decreasing altitude
  - Increase with increasing air density
  - Decrease with increasing speed
21. winglets
- decrease the static lateral stability
  - decrease the induced
  - increase the manoeuvrability
  - create an elliptical lift distribution
22. longitudinal control is provided by:
- Rudder
  - Ailerons
  - Elevators
  - flaps
23. When the aircraft is in straight and level flight the normal axis is:
- Horizontal
  - Vertical
  - Wing tip to wing tip
  - longitudinal
24. Which of the following statement, about a venturi in a sub –sonic airflow are correct?
- the dynamic pressure in the undisturbed flow and in the throat are equal.
  - The total pressure in the undisturbed flow and the in the throat are equal
- 1 is incorrect and 2 is correct
  - 1 and 2 are correct
  - 1 is correct and 2 is incorrect
  - 1 and 2 are incorrect
25. If the indicated airspeed of an aircraft is increased from 80kts to 160kts, parasite drag will be:
- Four times greater
  - Six times greater

- c. One quarter as much
  - d. Half as much
26. 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
27. The angle of attack of two dimensional wing section is the angle between:
- a. The fuselage centre line and the free steam direction
  - b. The chord line of the aerofoil and the fuselage centre line
  - c. The chord line and the camber of the aerofoil
  - d. The chord line of the aerofoil and the free stream direction
28. 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
29. 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
30. 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
31. For an aircraft with a 1g stalling speed of 60kts IAS ,the stalling speed in a steady 60° turn would be:
- a. 60kt
  - b. 43kts
  - c. 84kts
  - d. 120kts

32. When the angle of attack of a symmetrical aerofoil is increased, the centre of pressure will:
- Have very limited movement
  - Is unaffected
  - Move forward to the leading
  - Move aft along the aerofoil
33. On an airfoil the centre of pressure will be most forward
- at the optimum angle
  - at the stalling angle
  - just above the stalling angle
  - just above the stalling angle
34. The angle of attack of an aerofoil section directly controls:
- Amount of airflow above and below the section
  - Angle of incidence of the section
  - Distribution of positive and negative pressure acting on the section
  - The angle relative to the horizontal datum
35. At zero angle of attack, the pressure along the upper surface of a symmetrical aerofoil section would be:
- Greater than atmospheric pressure
  - Equal to atmospheric pressure
  - Less than atmospheric pressure
  - Non existent
36. 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
37. 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

38. 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.
39. With flaps lowered ,the stalling speed will:
- Increase
  - Decrease
  - Increase ,but occurs at a higher angle of attack
  - Remain the same
40. 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.
41. Vortex generators are used :
- To reduce induced drag
  - To reduce boundary layer separation
  - To induce a root stall
  - To counteract the effect of wing-tip vortices
42. The best L/D ratio of an aircraft occurs when parasite drag is :
- A minimum
  - Equal to induced drag
  - Greater than induced
  - Less than induced drag
43. At a given True air speed, what effect will increased air density have on lift and drag of an aircraft?
- Lift will increase but drag will decrease
  - Lift and drag will increase
  - Lift and drag will decrease
  - Lift and drag will remain the same
44. If indicated air speed of an aircraft in level flight is increased from 150kt to 300kt, what change will occur in (i
45. ) TAS (ii) Cdi (iii)?
- |      | (i) | (ii)           | (iii)          |
|------|-----|----------------|----------------|
| i.   | 2   | $\frac{1}{4}$  | $\frac{1}{16}$ |
| ii.  | 4   | $\frac{1}{16}$ | $\frac{1}{4}$  |
| iii. | 2   | $\frac{1}{16}$ | $\frac{1}{4}$  |
| iv.  | 0   | 4              | 16             |



46. A wing with wash out would have :
- a. The tip chord less than the root chord
  - b. The tip incidence less than the root incident
  - c. The tip incidence greater than the root incidence
  - d. The tip camber less than the root camber.

**PART II**

1. Using a diagram, explain the generation of LIFT. (6MKS)

2. Using diagrams ,explain the difference in;

- a. Krueger flap
- b. Fowler flap
- c. Plain flap

(6mks)

3. A) What is drag?

(2mks)

b) list down the different types of drag

(3mks)

c) Using a well-illustrated drag curve diagram ,explain the effect of Weight and Flap deployment.

(8marks)