



EAST AFRICAN SCHOOL OF AVIATION EXAMINATION

SAFETY SECTION

DIPLOMA IN FLIGHT DISPATCH

FLD 37/38

FINAL EXAMINATION

SUBJECT: GENERAL NAVIGATION

Duration: 02 Hrs 00 Min

DAY/DATE:

TIME: 1400HRS – 1600HRS

Instructions to Candidate:

- a. Total marks are 70
- b. This paper consists of Seven (7) printed pages
- c. Examination rules and regulations shall be adhered to
- d. Answer all the questions in section one and section two

SECTION A (40 MARKS)

1. A direct Mercator graticule is based on a projection that is:

- A spherical
- B concentric
- C cylindrical
- D conical

1. Which is the highest latitude listed below at which the sun will rise above the horizon and set every day?

- A 62°
- B 66°
- C 68°
- D 72°

2. A straight line drawn on a chart measures 4.63 cm and represents 150 NM. The chart scale is:

- A 1 : 5 000 000
- B 1 : 1 000 000
- C 1 : 6 000 000
- D 1 : 3 000 000

3. 730 FT/MIN equals:

- A 1.6 m/sec
- B 2.2 m/sec
- C 3.7 m/sec
- D 5.2 m/sec

4. Given: Distance A to B = 120 NM, After 30 NM aircraft is 3 NM to the left of course. What heading alteration should be made in order to arrive at point 'B'?

- A 4° right
- B 8° left
- C 8° right
- D 6° right

5. An Agonic line is a line that connects:

- A positions that have the same variation
- B points of equal magnetic dip
- C points of equal magnetic horizontal field strength
- D positions that have 0° variation

6. The main reason that day and night, throughout the year, have different duration, is due to the:

- A gravitational effect of the sun and moon on the speed of rotation of the earth
- B inclination of the ecliptic to the equator
- C earth's rotation
- D relative speed of the sun along the ecliptic

7. An aircraft at FL350 is required to descend to cross a DME facility at FL80. Maximum rate of descent is 1800

FT/MIN and mean GS for descent is 276 kt. The minimum range from the DME at which descent should start is:

- A 49 NM
- B 59 NM
- C 69 NM
- D 79 NM

8. Civil twilight is defined by :

- A sun upper edge tangential to horizon
- B sun altitude is 6° below the celestial horizon
- C sun altitude is 12° below the celestial horizon
- D sun altitude is 18° below the celestial horizon

9. Given: The coordinates of the heliport at Issy les Moulineaux are: N48°50' E002°16.5' The coordinates of the antipodes are :

- A S48°50' W177°43.5'
- B S48°50' E177°43.5'
- C S41°10' W177°43.5'
- D S41°10' E177°43.5'

10. Which of the following statements concerning the earth's magnetic field is completely correct?

- A The earth's magnetic field can be classified as transient, semi-permanent or permanent
- B Dip is the angle between total magnetic field and vertical field component
- C The blue pole of the earth's magnetic field is situated in North Canada
- D At the earth's magnetic equator, the inclination varies depending on whether the geographic equator is north or south of the magnetic equator

11. What is the value of the magnetic dip at the magnetic South Pole?

- A 90°
- B 45°
- C 60°
- D 0°

12. An aircraft at latitude $02^\circ 20' N$ tracks $180^\circ (T)$ for 685 km. On completion of the flight the latitude will be:

- A $04^\circ 10' S$
- B $04^\circ 30' S$
- C $09^\circ 05' S$
- D $03^\circ 50' S$

13. On a Lambert Conformal Conic chart earth convergence is most accurately represented at the:

- A Equator
- B parallel of origin
- C north and south limits of the chart
- D standard parallels

14. An aircraft is planned to fly from position 'A' to position 'B', distance 480 NM at an average GS of 240 kt. It departs 'A' at 1000 UTC. After flying 150 NM along track from 'A', the aircraft is 2 MIN behind planned time.

Using the actual GS experienced, what is the revised ETA at 'B'?

- A 1203
- B 1153
- C 1157
- D 1206

15. How long will it take to fly 5 NM at a groundspeed of 269 Kt?

- A 1 MIN 07 SEC
- B 1 MIN 55 SEC
- C 2 MIN 30 SEC

D 0 MIN 34 SEC

16. At what approximate latitude is the length of one minute of arc along a meridian equal to one NM (1852 m) correct?

A 30°

B 45°

C 0°

D 90°

17. At what approximate date is the earth closest to the sun (perihelion)?

A Beginning of July

B End of June

C Beginning of January

D End of March

18. How many NM would an aircraft travel in 1 MIN 45 SEC if GS is 135 kt?

A 3.94

B 2.36

C 3.25

D 39.0

19. The total length of the 53°N parallel of latitude on a direct Mercator chart is 133 cm. What is the approximate scale of the chart at latitude 30°S?

A 1 : 25 000 000

B 1 : 30 000 000

C 1 : 18 000 000

D 1 : 21 000 000

20. An aircraft flies a great circle track from 56° N 070° W to 62° N 110° E. The total distance travelled is?

A 1788 NM

B 2040 NM

C 3720 NM

D 5420 NM

21. The Local Mean Time at longitude 095°20'W, at 0000 UTC, is :

A 0621:20 previous day

B 1738:40 same day

C 0621:20 same day

D 1738:40 previous day

22. Given: GS = 120 kt. Distance from A to B = 84 NM. What is the time from A to B?

A 00 HR 42 MIN

B 00 HR 43 MIN

C 00 HR 44 MIN

D 00 HR 45 MIN

23. In which two months of the year is the difference between the transit of the Apparent Sun and Mean Sun across the Greenwich Meridian the greatest?

A June and December

B April and August

C February and November

D March and September

24. The diameter of the Earth is approximately:

- A 12 700 km
- B 6 350 km
- C 18 500 km
- D 40 000 km

25. The parallels on a Lambert Conformal Conic chart are represented by:

- A straight lines
- B parabolic lines
- C hyperbolic lines
- D arcs of concentric circles

26. At a specific location, the value of magnetic variation:

- A depends on the magnetic heading
- B depends on the true heading
- C varies slowly over time
- D depends on the type of compass installed

27. An aircraft at position $60^{\circ}\text{N } 005^{\circ}\text{W}$ tracks $090^{\circ}(\text{T})$ for 315 km. On completion of the flight the longitude will be:

- A $000^{\circ}15'\text{E}$
- B $000^{\circ}40'\text{E}$
- C $005^{\circ}15'\text{E}$
- D $002^{\circ}10'\text{W}$

28. At 47° north the chart distance between meridians 10° apart is 5 inches. The scale of the chart at 47° North approximates:

- A 1 : 6 000 000
- B 1 : 8 000 000
- C 1 : 3 000 000
- D 1 : 2 500 000

29. Given: true track is 348° , drift 17° left, variation 32° W, deviation 4°E . What is the compass heading?

- A 359°
- B 337°
- C 033°
- D 007°

30. The angle between the true great-circle track and the true rhumb-line track joining the following points: A ($60^{\circ}\text{ S } 165^{\circ}\text{ W}$) B ($60^{\circ}\text{ S } 177^{\circ}\text{ E}$), at the place of departure A, is:

- A 7.8°
- B 9°
- C 15.6°
- D 5.2°

31. Given: value for the ellipticity of the Earth is $1/297$. Earth's semi-major axis, as measured at the equator, equals 6378.4 km. What is the semi-minor axis (km) of the earth at the axis of the Poles?

- A 6 356.9
- B 6 378.4
- C 6 367.0
- D 6 399.9

32. Parallels of latitude, except the equator, are:

- A Rhumb lines
- B Great circles
- C both Rhumb lines and Great circles
- D are neither Rhumb lines nor Great circles

33. What is the effect on the Mach number and TAS in an aircraft that is climbing with constant CAS?

- A Mach number increases; TAS increases
- B Mach number remains constant; TAS increases
- C Mach number decreases; TAS decreases
- D Mach number increases; TAS remains constant

34. The angular difference, on a Lambert conformal conic chart, between the arrival and departure track is equal to:

- A earth convergence
- B conversion angle
- C difference in longitude
- D map convergence

35. In a navigation chart a distance of 49 NM is equal to 7 cm. The scale of the chart is approximately:

- A 1 : 1 300 000
- B 1 : 700 000
- C 1 : 130 000
- D 1 : 7 000 000

36. A Lambert conformal conic projection, with two standard parallels:

- A shows lines of longitude as parallel straight lines
- B the scale is only correct along the standard parallels
- C shows all great circles as straight lines
- D the scale is only correct at parallel of origin

37. On a Mercator chart, the scale:

- A varies as $1/2$ cosine of the co-latitude
- B varies as $1/\text{cosine}$ of latitude ($1/\text{cosine} = \text{secant}$)
- C varies as the sine of the latitude
- D is constant throughout the chart

38. Compass deviation is defined as the angle between:

- A True North and Compass North
- B the horizontal and the total intensity of the earth's magnetic field
- C Magnetic North and Compass North
- D True North and Magnetic North

39. An aircraft is planned to fly from position 'A' to position 'B', distance 250 NM at an average GS of 115 kt. It departs 'A' at 0900 UTC. After flying 75 NM along track from 'A', the aircraft is 1.5 MIN behind planned time.

Using the actual GS experienced, what is the revised ETA at 'B'?

- A 1044 UTC
- B 1050 UTC
- C 1115 UTC

D 1110 UTC

SECTION B (30 MARKS)

1. The rhumbline track from P to Q in the Southern Hemisphere is $079^{\circ}(T)$ if the convergency between P and Q is 60, find the great circle bearing from Q to P. 5 marks
2. Position A is located on the equator at longitude $130^{\circ}00'E$. Position B is located 100 NM from A on a bearing of $225^{\circ}(T)$. The coordinates of position B are: 5 marks
3. Given: true track 070° variation $30^{\circ}W$ deviation $+1^{\circ}$ drift $10^{\circ}R$ Calculate the compass heading? 5 marks
4. An aircraft at FL370 is required to commence descent at 120 NM from a VOR and to cross the facility at FL130. If the mean GS for the descent is 288 kt, the minimum rate of descent required is: 5 marks
5. Draw VOR, DME and NDB symbols 5 marks
6. If the LMT at 'A', $40^{\circ}N 137^{\circ}50'W$, is 1812 LMT on 18 August, what is the LMT at 'B', $30^{\circ}S 121^{\circ}12'E$? 5 marks