



EAST AFRICAN SCHOOL OF AVIATION

EXAMINATIONS

FINAL EXAM

SAFETY SECTION

SUBJECT: RADIO NAVIGATION

Stream: Flight Dispatch 25

Duration: 2Hrs

DATE: 17/05/17

TIME: 8.30 – 10.30AM

Instructions to Candidate:

1. *This paper consists of **EIGHT (8)** pages*
2. *Answer **ALL** questions in **Section A** and **B***
3. *Examination rules and regulations should be adhered to.*
4. *Maximum marks are indicated on each question*

STUDENT'S NAME:

STUDENT'S NUMBER:

1. The BFO selector on an ADF receiver is used to:
A hear the IDENT and must always be switched ON
B find the loop 'null' position
C hear the IDENT of some NDB stations radiating a continuous wave signal
D stop loop rotation

2. An aircraft on a heading of 280°(M) is on a bearing of 090°(M) from a VOR. The bearing you should select on the OMNI bearing selector to centralise the VOR/ILS left/right deviation needle with a 'TO' indication is:
A 280° B 270° C 090° D 100°

3. Factors liable to affect most NDB/ADF system performance and reliability include:
A static interference - night effect - absence of failure warning system
B static interference - station interference - latitude error
C height error - station interference - mountain effect
D coastal refraction - lane slip - mountain effect

4. If an aircraft flies along a VOR radial it will follow a:
A constant magnetic track
B great circle track
C rhumbline track
D line of constant bearing

5. 'Night Effect' which causes loss of signal and fading, resulting in bearing errors from NDB transmissions, is due to:
A static activity increasing at night particularly in the lower frequency band
B the effect of the Aurora Borealis
C skywave distortion of the null position and is maximum at dawn and dusk
D interference from other transmissions and is maximum at dusk when east of the NDB

6. An aircraft is flying on a heading of 270°(M). The VOR OBS is also set to 270° with the full left deflection and FROM flag displayed. In which sector is the aircraft from the VOR ground station?
A SE B NE C NW D SW

7. What is the approximate maximum theoretical range at which an aircraft at FL130 could receive information from a VDF facility which is sited 1024 FT above MSL?
A 150 NM B 180 NM C 220 NM D 120 NM

8. Which of the following is the ICAO allocated frequency band for ADF receivers?
A 200 - 2000 kHz B 200 - 1750 kHz C 255 - 455 kHz D 300 - 3000 kHz

9. There are two NDBs, one 20 NM inland, and the other 50 NM inland from the coast. Assuming that the error caused by coastal refraction is the same for both propagations, the extent of the error in a position line plotted by an aircraft that is over water will be:
 A the same from both beacons when the aircraft is on a relative bearing of 090° and 270°
 B greater from the beacon that is 50 NM inland
 C the same from both beacons when the aircraft is on a relative bearing of 180° and 360°
 D greater from the beacon that is 20 NM inland
10. ADF bearings by an aeroplane by day within the published protection range should be accurate to within a maximum error of:
 A +/-5° B +/-10° C +/-2.5° D +/-2°
11. What is the colour sequence when passing over an Outer, Middle and Inner Marker beacon?
 A blue - amber – white B amber - white - green
 C white - amber – blue D blue - green – white
12. The OUTER MARKER of an Instrument Landing System (ILS) facility transmits on a frequency of:
 A 200 MHz and is modulated by alternate dot/dash in morse
 B 75 MHz and is modulated by alternate dot/dash in morse
 C 300 MHz and is modulated by morse at two dashes per second
 D 75 MHz and is modulated by morse at two dashes per second
13. Quadrantal errors associated with aircraft Automatic Direction Finding (ADF) equipment are caused by:
 A misalignment of the loop aerial
 B skywave/groundwave contamination
 C signal bending by the aircraft metallic surfaces
 D signal bending caused by electrical interference from aircraft wiring
14. Which frequency band is used by VOR transmissions?
 A VHF B UHF C SHF D HF
15. If the reference phase differs 30° with the variable phase the radial from the VOR station will be :
 A 210° B 150° C 030° D 330°
16. The main factor which determines the minimum range that can be measured by a pulsed radar is pulse:
 A)frequency. B)length.
 C)amplitude. D)repetition rate

17. An Omni-bearing selector (OBS) shows full deflection to the left when within range of a serviceable VOR.

What angular deviation are you from the selected radial?

- A 1.5° or more B 2.5 or more C 10° or more D less than 10°

18. In which one of the following circumstances is ground direction finding (VDF) likely to be used to fix an aircraft's position?

- A When contacting ATC to join controlled airspace from the open FIR
B When declaring an emergency on any frequency
C When using the emergency VHF frequency 121.5 MHz
D On first contact with ATC on crossing an international FIR boundary

19. Transmissions from VOR facilities may be adversely affected by:

- A night effect
B quadrantal error
C uneven propagation over irregular ground surfaces
D static interference

20. Given : Compass heading 270° Deviation 2°W Variation 30°E Relative bearing 316°
What is the QDR?

- A 044° B 226° C 046° D 224°

21. What is the wavelength of an NDB transmitting on 375 kHz?

- A 8000 m B 8 m C 80 m D 800 m

22. An apparent increase in the transmitted frequency which is proportional to the transmitter velocity will occur when:

- A the transmitter moves away from the receiver
B the receiver moves towards the transmitter
C both transmitter and receiver move towards each other
D the transmitter moves towards the receiver

23. An aircraft carrying out a 3° glidepath ILS approach experiences a reduction in groundspeed from 150 kt at the outer marker to 120 kt over the threshold. The effect of this change in groundspeed on the aircraft's rate of

descent will be a decrease of approximately:

- A 100 FT/MIN B 150 FT/MIN C 250 FT/MIN D 50 FT/MIN

24. Which of the following is likely to have the greatest effect on ADF accuracy?

- A Interference from other NDBs, particularly at night
B Frequency drift at the ground station
C Interference from other NDBs, particularly during the day

D Mutual interference between aircraft aerials

25. In order to obtain an ADF bearing the:

A sense aerial must be tuned separately

B mode selector should be switched to 'loop'

C BFO switch must be selected to 'ON'

D signal must be received by both the sense and loop aerials

26. An aircraft on an ILS approach is receiving more 90Hz modulation than 150Hz modulation in both localiser and glidepath. The correct action to regain the centreline and glidepath would be to:

(a) reduce rate of descent and fly left

(b) increase rate of descent and fly right

(c) reduce rate of descent and fly right

(d) increase rate of descent and fly left

27. An aircraft on a 3° ILS approach at 150kt groundspeed is required to reduce its speed to 120kts at the outer marker, 4½nm from the threshold. The rate of descent should reduce by approximately:

(a) 120 ft/min (b) 150 ft/min (c) 170 ft/min (d) 190 ft/min

28. The principle of operation of MLS is:

(a) lobe comparison of scanning beams

(b) phase comparison directional beams

(c) time referenced scanning beams

(d) frequency comparison of reference beams

29. In a primary radar system

(a) The aircraft plays the secondary role, just listening to the radar signals from the ground radar

(b) All radio frequency energy is produced by the radar located at the radar site

(c) The radar is primarily used for range-finding

(d) The radar is the primary aid for ATC

30. With regard to the advantages of SSR which of the following statements is correct?

(a) range, bearing and height can be calculated from reply signals

(b) No aircraft manoeuvres are necessary for identification

(c) Little power is required to effect longish range

(d) All of the above

31. The basic principle of operation of a standard VOR is by:

(a) Phase comparison between an amplitude modulated reference signal and a frequency modulated variable signal.

- (b) Phase difference between a frequency modulated reference signal and an amplitude modulated variable signal.
- (c) Phase comparison between a 108 Mhz reference signal and a 30 Hz variable signal.
- (d) Phase comparison between a 30 Hz reference signal and a 108 Mhz variable signal.

32. An aircraft heading 040 (M) has an ADF reading of 060 Relative. The alteration of heading required to intercept the 120 track inbound to the NDB at 50° is:
 A)030° Right. B)050° Right. C)040° Right. D)020° Right.

33. The MF band extends from:

- A)3 to 30 KHz. B)30 to 300 KHz.
- C)100 to 1000 KHz. D)300 to 3000 KHz.

34. Which of the following statements is correct in respect of a RF signal:

- A) the plane of polarisation is dictated by the oscillator unit in the transmitter.
- B) the electrical component of the signal is parallel to the aerial.
- C) both the electrical and magnetic components are parallel to the aerial.
- D) the magnetic component of the signal is parallel to the aerial.

35. A pilot wishes to obtain the magnetic bearing of his aircraft from a VDF station. Which of the following terms would he use:

- A)QGH B)QDM C)QTE D)QDR

36. The maximum theoretical range at which a VHF signal will be received by an aircraft flying at FL 200, assuming that the transmitter is sited at 860 ft amsl, and that there is no intervening high ground:

- A)144 nm. B)170 nm .C)213 nm. D)180 nm.

37. Of two sinusoidal waves of the same amplitude and frequency, Wave A is passing zero going negative when Wave B is at maximum positive. Which of the following statements accurately describes this situation

- A) wave A leads wave B by 360° .
- B) wave A leads wave B by 180° .
- C) wave A leads wave B by 90° .
- D) wave A leads wave B by 270° .

38. In an amplitude modulated signal, the amplitude of the carrier wave will:

- A) vary according to the amplitude of the modulating signal.
- B) vary according to the phase of the modulating signal.
- C) vary according to the frequency of the modulating signal.
- D) remain constant, and the frequency will vary according to the amplitude of the modulating signal.

39. To establish and maintain effective HF communications the frequency used at a given range:

- A) should be increased at night.
- B) should remain constant.
- C) should only be varied by season, decreased in summer and increased in winter.
- D) should be decreased at night.

40. A radio wave increases speed when crossing the coast, leaving the land and passing over the sea. When this happens:

- A) the wavelength changes.
- B) the frequency changes.
- C) the frequency increases..
- D) no change in either.

41. If the (i) of a radio wave is (ii) then the skip distance will (iii) and the dead space will (iv):

- A) (i) frequency; (ii) decrease; (iii) increase; (iv) decrease
- B) (i) wavelength; (ii) decrease; (iii) increase; (iv) decrease
- C) (i) frequency; (ii) increase; (iii) increase; (iv) increase
- D) (i) wavelength; (ii) increase; (iii) increase; (iv) increase

42. Ground responders respond at a frequency:

- A) 63 MHz greater than interrogation frequency.
- B) 63 MHz different from interrogation frequency, either above or below.
- C) the same as the interrogation signal.
- D) 63 MHz lower than interrogation frequency.

43. The rate of attenuation of a radio wave which occurs when the wave travels close to the Earth's surface.

- A) increases as the frequency of the wave increases, and is greater over the sea than the land.
- B) increases as the frequency of the wave increases, and is greater over the land than the sea.
- C) decreases as the frequency of the wave increases, and is greater over the land than the sea.
- D) decreases as the frequency of the wave increases, and is greater over the sea than the land.

44. Abnormal long ranges may be experienced on VDF channels, caused by:

- A) Intermodulation with signals on frequencies close to the one used by the VDF station.
- B) Super refraction of signals in the atmosphere.
- C) Efficient VDF antennas.
- D) The VDF station using a relay station for communication to the aircraft.

45. A half wave dipole aerial suitable for transmitting an RF signal at 18 MHz should have an effective length of:

- A)16,67 metres. B)83,33 metres C)166,67 metres. D)8,33 metres.
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SECTION B 10 MARKS

1. An 8800 MHz transmitter is moving directly away from a receiver at 291KTS. Calculate the frequency shift. (2 marks)
 2. An aircraft 5nm from touchdown is flying a 3 degrees glide slope at a ground speed of 200KTS. Determine the height the aircraft should be and the rate of descent required (Using the 1:60 rule). (5MARKS)
 3. An air weather radar has 400 pps PRR. Calculate the maximum range for this equipment. (3 MARKS)
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