

EAST AFRICAN SCHOOL OF AVIATION

RADIO NAVIGATION EXAM

1. An aeroplane requesting a VDF bearing should:
 - a) Avoid banking during transmission
 - b) Not pass overhead VDF aerial
 - c) Ensure that radio silence is maintained
 - d) Transmit on 121.5 MHz
2. The VDF class B bearing is accurate to within:
 - a) $\pm 1^\circ$
 - b) $\pm 2^\circ$
 - c) $\pm 3^\circ$
 - d) $\pm 5^\circ$
3. The phase difference between the reference and variable signals on QDM 050° (VAR 10° W) for a conventional VOR is:
 - a) 050°
 - b) 040°
 - c) 230°
 - d) 220°
4. Refer to figure. An aircraft is attempting to track 186° M on an airway defined by a VOR 80 nm away. The VOR indicates the aircraft position. With these indications the aircraft is on the ___ radial and ___ the airway.
 - a) 001° outside
 - b) 181° inside
 - c) 001° inside
 - d) 181° outside
5. An aircraft is on radial 120 with a magnetic heading of 300° , the track selector (OBS) reads: 330. The indications on the Course Deviation Indicator (CDI) are fly:
 - a) left with FROM showing
 - b) right with TO showing
 - c) right with FROM showing
 - d) left with TO showing
6. The antenna polar diagram of a conventional VOR:
 - a) Is always directed towards the aircraft
 - b) Is like a figure of 8
 - c) Is a pencil beam
 - d) Rotates at 30 revolutions per second

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

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

8. In a conventional VOR the direction of rotation of the signal will be (i) and the variable signal is (ii). In doppler VOR the reference signal is (iii) and the direction of rotation will (iv):

- a) Clockwise; (ii) FM; (iii) FM; (iv) Clockwise
- b) Anticlockwise; (ii) AM; (iii) AM; (iv) Clockwise
- c) Clockwise; (ii) AM; (iii) AM; (iv) Anticlockwise
- d) Anticlockwise; (ii) FM; (iii) AM; (iv) Anticlockwise

9. A relative bearing indicator shows 030°. The heading of the aeroplane is 090° M. The intercept angle for a course to the NDB of 180° M is:

- a) 120°
- b) 030°
- c) 150°
- d) 060°

10. An NDB is on a relative bearing of 316° from an aircraft.

Given:

Compass heading 270

At aircraft deviation 2W, Variation 30E

At station Variation 28E

Calculate the true bearing of the NDB from the aircraft:

- a) 252
- b) 254
- c) 072
- d) 074

11. To maintain the 314° QDR inbound to a NDB with 7° starboard drift, the heading in °M and relative bearing will be:

- a) 321; 173
- b) 127; 007
- c) 141; 353
- d) 307; 183

12. The DME (Distance Measuring Equipment) operates within the following frequencies:

- a) 329 to 335 MHz
- b) 962 to 1213 KHz
- c) 962 to 1213 MHz

d) 108 to 118 MHz

13. A category III ILS system provides accurate guidance down to:

- a) the surface of the runway
- b) less than 50 ft
- c) less than 100 ft
- d) less than 200 ft

14. The OUTER MARKER of an Instrument Landing System (ILS) facility transmits on a frequency of:

- a) 300 MHz and is modulated by Morse at two dashes per second
- b) 200 MHz and is modulated by alternate dot/dash in Morse
- c) 75 MHz and is modulated by alternate dot/dash in Morse
- d) 75 MHz and is modulated by Morse at two dashes per second

15. The MIDDLE MARKER of an Instrument Landing System (ILS) facility is identified audibly and visually by a series of:

- a) alternate dots and dashes and an amber light flashing
- b) two dashes per second and a blue light flashing
- c) dots and a white light flashing
- d) dashes and an amber light flashing

16. An aircraft carrying out an ILS approach is receiving more 90 Hz than 150 Hz modulation notes from both the localiser and glide path transmitters.

The ILS indication will show:

- a) Fly right and fly down
- b) Fly left and fly down
- c) Fly right and fly up
- d) Fly left and fly up

17. Which of the following is an ILS localiser frequency?

- a) 112,10 MHz
- b) 108,25 MHz
- c) 110,20 MHz
- d) 109,15 MHz

18. The upper limit of the vertical coverage of the localiser must be:

- a) not less than 300 m above the highest point on the approach
- b) not less than 7° above the horizontal (drawn from the localiser)
- c) not less than 600 m above the horizontal
- d) not less than 35° above the horizontal

19. The glide path signals must be received to a range of 10 nm over a sector:

- a) 10° each side of the localiser centre line
- b) 10° wide centred on the localiser centre line
- c) each side of the localiser centre line
- d) 8° wide centred on the localiser centre line

20. Which of the following is TRUE in respect of using ILS?
- a) When using a CDI you must set the OBS to the localiser course
 - b) When using a CDI in the overshoot sector you must disobey the needles
 - c) When using an HSI you must set the course arrow to the localiser course
 - d) When using an HSI the glide path must be set before approach
21. What is the audio frequency of the inner marker?
- a) 400 Hz
 - b) 1300 Hz
 - c) 3000 Hz
 - d) 75 MHz
22. Which of the following is correct regarding false beams on a glide path?
- a) False beams will only be found more than 10 degrees
 - b) False beams will only be found above the correct glide path
 - c) False beams are only present when flying a back beam ILS approach
 - d) False beams will only be found below the correct glide path
23. Which of the following is an advantage of MLS?
- a) Can be used in inhospitable terrain
 - b) Uses the same aircraft equipment as ILS
 - c) Has a selective access ability
 - d) Is not affected by heavy precipitation
24. The coverage of MLS is ___ either side of the centre line to a distance of ___
- a) 40 deg ; 40 nm
 - b) 40 deg ; 20 nm
 - c) 20 deg ; 20 nm
 - d) 20 deg ; 40 nm
25. Which one of the following is an advantage of a Microwave Landing System (MLS) compared with an Instrument Landing System (ILS)?
- a) It does not require a separate azimuth (localiser) and elevation (azimuth) transmitter
 - b) It is insensitive to geographical site and can be installed at sites where it is not possible to use an ILS
 - c) The installation does not require to have a separate method (marker beacons or DME) to determine range
 - d) There is no restriction on the number of ground installations that can be operated because there is an unlimited number of frequency channels available
26. In relation to primary radar, what does the term Pulse Recurrence Frequency signify?
- a) The radar frequency used
 - b) The number of revolutions performed by the radar antenna per minute
 - c) The number of pulses transmitted per second
 - d) The time between each transmission of pulses
27. The main factor which determines the minimum range that can be measured by a pulsed radar is pulse:

- a) repetition rate
- b) amplitude
- c) length
- d) frequency

28. The main advantage of a slotted scanner is:

- a) reduces side lobes and directs more energy into the main beam
- b) removes the need for azimuth slaving
- c) side lobe suppression
- d) can produce simultaneous map and weather information

29. For any given circumstances, in order to double the effective range of a primary radar the power output must be increased by a factor of:

- a) 2
- b) 16
- c) 4
- d) 8

30. A radar facility transmitting at a Pulse Recurrence Frequency (PRF) of 1200 pulses/second will have a maximum unambiguous range of approximately:

- a) 135 NM
- b) 69 NM
- c) 270 NM
- d) 27 NM

31. A wavelength of 8.5 mm corresponds to a frequency of:

- a) 2833.3 MHz
- b) 35294 MHz
- c) 3529.4 MHz
- d) 28333 MHz

32. To increase the maximum theoretical range of a pulse radar system:

- a) reduce the PRF and increase the power
- b) increase the PRF and reduce the power
- c) reduce the PRF and increase the PRF
- d) maintain the PRF and increase the power

33. In order to be able to penetrate cloud, a primary radar signal must have:

- a) a short pulse length
- b) a high frequency
- c) a long wavelength
- d) a high PRF

34. A frequency of airborne weather radar is:

- a) 9375 MHz

- b) 9375 GHz
- c) 9375 kHz
- d) 93.75 MHz

35. The Coscant squared beam is used for mapping in the AWR because:

- a) a greater range can be achieved
- b) a wider beam is produced in azimuth to give a greater coverage
- c) a larger area of ground is illuminated by the beam
- d) it allows cloud detection to be effected whilst mapping

36. If the AWR transmitter is required to be switched on before take-off the scanner should be tilted up with:

- a) either of these modes selected
- b) the mapping mode selected
- c) the weather mode selected
- d) none of these

37. The main factors which affect whether an AWR will detect a cloud are:

- a) the size of the water droplets and the diameter of the antenna reflector
- b) the scanner rotation rate and the frequency/wavelength
- c) the size of the water droplets and the wavelength/frequency
- d) the size of the water droplets and the range of the cloud

38. A frequency of 10 GHz is considered to be the optimum for use in an airborne weather radar system because:

- a) the larger water droplets will give good echoes and the antenna can be kept relatively small
- b) greater detail can be obtained at the more distant ranges of the smaller water droplets
- c) static interference is minimised
- d) less power output is required in the mapping mode

39. The advantage of the use of slotted antennas in modern radar technology is to:

- a) simultaneously transmit weather and mapping beams
- b) virtually eliminate lateral lobes and as a consequence concentrate more energy in the main beam
- c) have a wide beam and as a consequence better target detection
- d) eliminate the need for azimuth slaving

40. The accuracy of SSR height as displayed to the air traffic controller is:

- a) +/- 25 ft
- b) +/- 50 ft
- c) +/- 75 ft
- d) +/- 100 ft

41. When a Mode C check is carried out, and assuming the equipment is working without error, the Mode C will report a pressure altitude of 35.064 ft as flight level:

- a) 350
- b) 35064
- c) 3506
- d) 351

42. Why is the effect of returns from storms not a problem with SSR?
- The frequency is too high
 - SSR does not use the echo principle
 - The PRF is jittered
 - By the use of MTI to remove stationary and slow moving returns
43. Which statement regarding Mode S transponders is most correct?
- Mode S transponders reduce RT traffic and provide a datalink facility
 - Mode S transponders are used with TCAS III
 - Mode S transponders are used to assist GPS positioning
 - Mode S and Mode C transponders operate on different frequencies
44. Why is a secondary radar display screen free of storm clutter?
- The principle of echo return is not used in secondary radar
 - The frequencies employed are too high to give returns from moisture sources
 - A moving target indicator facility suppresses the display of static or near static returns
 - The frequencies employed are too low to give returns from moisture sources
45. In the SSR response, the operation of the transponder ident button:
- transmits the aeroplanes registration or flight number as a data coded sequence
 - sends a special pulse after the normal response pulse train
 - sends a special pulse before the normal response pulse train
 - sends a special pulse in the X position on the pulse train
46. Data transmission and exchange is conducted in:
- Mode A
 - Mode C
 - Mode D
 - Mode S
47. The required 24 NAVSTAR/GPS operational satellites are located on:
- 6 orbital planes with 3 satellites in each plane plus 6 reserve satellites positioned in a geostationary orbital plane
 - 3 orbital planes with 8 satellites in each plane
 - 4 orbital planes with 6 satellites in each plane
 - 6 orbital planes with 4 satellites in each plane
48. In relation to the satellite navigation system NAVSTAR/GPS, All in View is a term used when a receiver:
- is receiving the signals of all visible satellites but tracking only those of the 4 with the best geometric coverage
 - is tracking more than the required 4 satellites and can instantly replace any lost signal with another already being monitored
 - is receiving and tracking the signals of all 24 operational satellites simultaneously
 - requires the signals of all visible satellites for navigation purposes

49. Which of the following satellite navigation systems has Full Operational Capability (FOC) and is approved for specified flights under IFR conditions in Europe?

- a) NNSS-Transit
- b) NAVSTAR/GPS
- c) COSPAS-SARSAT
- d) GLONASS

50. The visibility of GPS satellites is:

- a) dependent on the location of the user
- b) greatest at the equator
- c) greatest at the poles
- d) the same at all points on and close to the surface of the earth

PART B 20 MARKS

1. State and explain 5 factors that affect propagation (10marks)
2. Name 5 forms of modulation (5marks)
3. What are the advantages of phased/flat plate array antennae over parabolic reflectors (5marks)