NAVIGATION (2)
RADIO NAVIGATION

1 An aircraft is "homing" to a radio beacon whilst maintaining a relative bearing of zero. If the magnetic heading decreases, the aircraft is experiencing:

A left drift
B right drift
C a wind from the west
D zero drift

2 What is the wavelength of an NDB transmitting on 375 kHZ?

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

3 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 'FROM' showing
C right with 'TO' showing
D left with 'TO' showing

4 The frequency range of a VOR receiver is:

A 108 to 117.95 MHz
B 108 to 111.95 MHz
C 118 to 135.95 MHz
D 108 to 135.95 MHz

5 An airway 10 NM wide is to be defined by two VORs each having a resultant bearing accuracy of plus or minus 5.5°.
In order to ensure accurate track guidance within the airway limits the maximum distance apart for the transmitter is approximately:

A 50 NM
B 105 NM
C 210 NM
D 165 NM

6 Distance Measuring Equipment (DME) operates in the:

A UHF band and uses two frequencies
B VHF band and uses the principle of phase comparison
C UHF band and uses one frequency
D SHF band and uses frequency modulation techniques

7 The aircraft DME receiver is able to accept replies to its own transmissions and reject replies to other aircraft interrogations because:

A pulse pairs are amplitude modulated with the aircraft registration
B pulse pairs are discreet to a particular aircraft
C transmission frequencies are 63 MHz different for each aircraft
D aircraft interrogation signals and transponder responses are 63 MHz removed from each other

8 The rate of descent required to maintain a 3.25° glide slope at a groundspeed of 140 kt is approximately:

A 760 FT/MIN
B 850 FT/MIN
C 670 FT/MIN
D 700 FT/MIN

9 Which of the following is an ILS localiser frequency?

A 108.25 MHz
B 109.15 MHz
C 112.10 MHz
D 110.20 MHz

10 A Primary radar operates on the principle of:

A transponder interrogation
B pulse technique
C continuous wave transmission
D phase comparison

11 In which frequency band do most airborne weather radars operate?

A SHF
B UHF
C EHF
D VHF

12 The maximum range obtainable from an ATC Long Range Surveillance Radar is approximately:

A 200-300 NM
B 100-200 NM
C 50-100 NM
D 300-400 NM

13 The ISO-ECHO facility of an airborne weather radar is provided in order to:

A inhibit unwanted ground returns
B extend the mapping range
C detect areas of possible severe turbulence in cloud
D give an indication of cloud tops

14 In Airborne Weather Radar (AWR), the main factors which determine whether a cloud will be detected are:

A range from cloud;
wavelength/frequency used

B size of the water drops;
wavelength/frequency used

C rotational speed of radar scanner;
range from cloud

D size of the water drops;
diameter of radar scanner

15 The ATC transponder system, excluding Mode S, contains:

A two modes, each of 4096 codes
B four modes, each 1024 codes
C four modes, each 4096 codes
D two modes, each 1024 codes

16 Under JAR-25 colour code rules specified display features colour set 1 for Electronic Flight Instrument Systems (EFIS), selected data and values are coloured:

A yellow
B magenta
C white
D green

17 Under which of the following circumstances does a VOR/DME Area Navigation system switch to Dead Reckoning mode?

A The system is receiving information from one VOR and one DME
B The system is receiving information from only one VOR
C The system is not receiving TAS information from the Air Data Computer.
D The system is receiving information from one VOR and two DMEs

18 Radar returns, on a B737-400, can be displayed on all Electronic Horizontal Situation Indicator (EHSI) screen modes of an Electronic Flight Instrument System (EFIS) WITH THE EXCEPTION OF:

A EXP VOR/ ILS, PLAN and MAP
B FULL NAV, FULL VOR/ILS and PLAN
C FULL VOR/ILS, EXP VOR/ILS and PLAN
D FULL NAV, PLAN and MAP

19 The Flight Management System (FMS) is organised in such a way that the pilot can:

A read and write at any time in the database
B modify the database every 14 days
C modify the data in the database between two updates
D insert navigation data between two database updates

20 Which of the following gives the best information about the progress of a flight between 2 en-route waypoints from a RNAV equipment?

A ETO
B ETD
C ATA
D Elapsed time on route.

21 In the Flight Management Computer (FMC) of the Flight Management System (FMS), data relating to cruising speeds is stored in the:

A navigation database
B auto flight computers
C performance database
D air data computer

22 (For this question use annex A)
What is the value of the track from TBX to YTB?

A 140°(M)
B 280°(T)
C 097°(T)
D 170°(M)

23 In relation to Area Navigation Systems (RNAV), which of the following is an Air Data input?

A Doppler drift
B VOR/DME radial/distance
C Inertial Navigation System (INS) position
D True airspeed

24 Which one of the following lists information given by a basic VOR/DME-based Area Navigation System?

A Wind velocity
B True airspeed; drift angle
C Crosstrack distance; alongtrack distance; angular course deviation
D Aircraft position in latitude and longitude

25 Which of the following correctly gives the principle of operation of the Loran C navigation system?

A Phase comparison between synchronised transmissions
B Differential range by phase comparison
C Frequency shift between synchronised transmissions
D Differential range by pulse technique

26 What is the inclination to the equatorial plane of the satellite's orbit in the NAVSTAR GPS constellation?

A 55°
B 45°
C 35°
D 65°

27 What is the minimum number of NAVSTAR/GPS satellites required to produce an accurate independent 3-D position fix?

A 3
B 24
C 5
D 4

28 The influence of the ionosphere on the accuracy of the satellite navigation system NAVSTAR/GPS is:

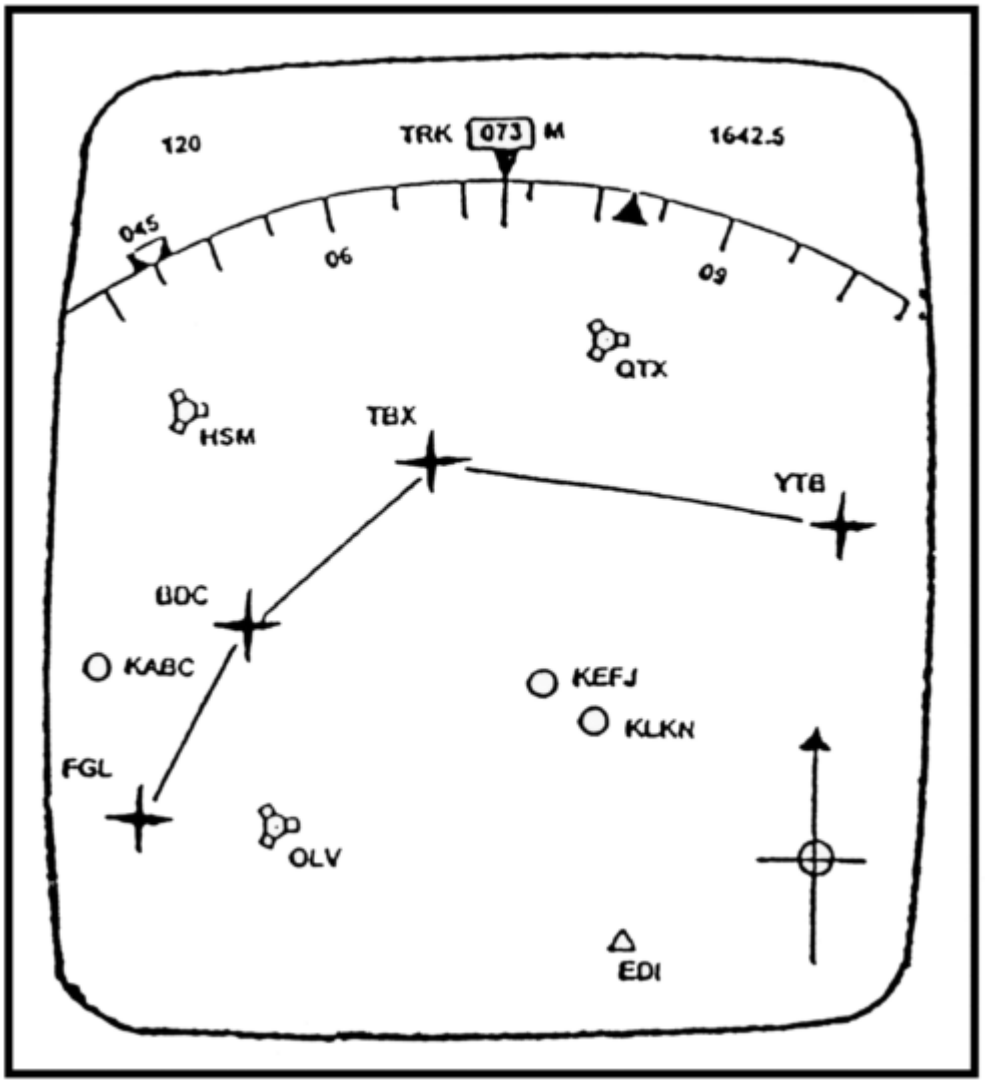
A minimised by computing the average of all signals
B minimised by the receiver using a model of the atmosphere and comparing signals transmitted by the satellites
C negligible
D only significant if the satellites are located at a small elevation angle above the horizon

29 Which of the following statements about the accuracy that can be obtained with the differential technique (D-GPS) of the satellite navigation system NAVSTAR/GPS is correct?

A The nearer a receiver is situated to a D-GPS ground station, the more accurate the position fix
B The increase in accuracy of position fixes is independent of the receiver position in relation to a D-GPS ground station
C A D-GPS receiver can detect and correct for SA providing a more accurate position fix
D Only D-GPS allows position fixes accurate enough for 'Non Precision Approaches'

Annex A

062-9916A



1. Answer B

2. Answer C

3. Answer D

4. Answer A

5. The greatest cross track error acceptable is 5nm off the airway centreline. We assume that the aircraft flies out of one beacon and then switches over half way to home to the next beacon so the greatest possible error will occur at the half way point. The 1 in 60 rule can be used here. Expressed as a formula it is:

$$\frac{\text{distance off track}}{\text{distance gone}} = \frac{\text{track error angle}}{60}$$

or,

$$\text{distance gone} = \frac{\text{distance off track} \times 60}{\text{track error angle}}$$

The maximum distance off track is 5nm, track error angle is 5.5º so

distance to half way = 5 x 60 ÷ 5.5 = 54.5nm
distance between the beacons is twice that, 109 nm.
Answer B

6. Answer A, the frequencies are in UHF and 63MHz apart.

7. DME uses pulse pairs, and they are unique because the PRF is randomised or jittered. Answer B.

8. Either use the formula,

$$\text{Rate of descent} = \frac{\text{glide angle}}{60} \times \frac{\text{groundspeed}}{60} \times 6080$$
$$= \frac{3.25}{60} \times \frac{140}{60} \times 6080$$
$$= 768 \text{ ft/min}$$

or use 5 x groundspeed and fudge it by a factor of 3.25 ÷ 3 to compensate for the steeper than usual glideslope:

5 x 140 = 700ft/min, 700 x 3.25 ÷ 3 = 758ft/min.

Answer A suggests the examiners used the second method.

9. ILS uses 108MHz to 111.95MHz and either odd 100KHz or 150KHz spacing. 109.15 fits, Answer B

10. A primary radar relies on reflection, and most use pulses, so B is the best answer.

11. SHF, Answer A.

12. At 35,000ft the radar horizon is about 235nm away so there's not much point having ground based radars with a possible range of more than 250nm. Answer A

13. Answer C

14. The size of the water drops has to be close(ish) to the radar wavelength. Answer B.

15. Tricky. They could mean Modes A and B, and these each have 4096 codes, or they could mean A and C, in which case Mode A has 4096 codes. There's no answer for 3 modes so it has to be Answer A, whatever was intended!

16. Answer D

17. Dead reckoning means figuring out where you are on the basis of past performance. 2D RNAV systems like the KNS80 usually only use one co-located VOR and DME to work out position so answer A represents normal operation and answer D would be wrong. Systems like this don't often take a TAS input because they are fitted to little aeroplanes which don't have ADCs or TAS computers so C is wrong. Answer B suggests only bearing information is available which means there is not enough data for a simultaneous fix and, if the RNAV system has a DR capability, this is when it might be used. Answer B

18. Answer B

19. We can't answer this question. A is certainly wrong, as is C. The database can be updated every 14 days, but not by the pilot, and the pilots can insert nav data into the RAM between updates, but not the database. Answer B or D.

20. ETO is new term, Estimated time Overhead? The UK CAA say it means the same as ETA. You check your progress by comparing the ETA on the FMS/RNAV, which is worked on current groundspeed, against your flight planned ETA. Answer A.

21. Answer C

22. Annex A shows a Boeing EFIS in the PLAN mode, the bottom two thirds of the display, below the compass arc, is orientated to true north. The track is about 100°T, Answer C.

23. Answer D

24. Answer C

25. Answer D

26. Answer A

27. Answer D

28. Answer B

29. Unanswerable. Differential GPS reduces errors caused by ionospheric and atmospheric distortion and corrected for Selective Availability (SA), now turned off. In both cases the closer you are to the differential ground station the closer your errors are to those corrected for. Answer A or C.