RADIO NAVIGATION EXAM

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

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

2. With regards to radio waves, which statement is true:

(a) They travel at 186,000nm a second in a vacuum.
(b) The longer the wavelength the greater the surface attenuation
(c) They are reflected by metallic objects with a size compatible to thewavelength.
(d) High frequencies need large aerials.

3. An HF transmitter is tuned to a frequency that refracts from the E layerin the Ionosphere. The maximum distance of the first returning skywaveis:

(a) 599 nm (b) 599 km (c) 1500 nm (d) 1500 km.

4. Which statement is true ?

(a) The lower the frequency the greater the atmospheric attenuation.
(b) The ionosphere will attenuate and refract signals up to 30 Ghz.
(c) The attenuation of an HF ground wave is worse over the land thanover ice.
(d) None of the above

5. The visual and aural indications of the ILS outer marker are :

(a) A blue light and 2 dashes per second of 400 Hz modulated tone.
(b) A white light and 6 dots per second of a 30 Hz modulated tone.
(c) An amber light and alternate dots and dashes of a 1300 Hzmodulated tone.
(d) A blue light and 2 dashes per second of a 1300 Hz modulated tone.

6. An aircraft heading 315°M shows an NDB bearing 180° on the RMI. Any quadrantal error affecting the accuracy of this bearing is likely to be

(a) at a minimum
(b) at a maximum
(c) zero, as quadrantal errors are not found on the RMI
(d) zero, as quadrantal errors affect only the VOR

7. An aircraft on an ILS approach is receiving more 90Hz modulation than150Hz 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

8. 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 parralel to the aerial.
D) the magnetic component of the signal is parallel to the aerial.

9. 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

10. 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° .

11. 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.

12. To estabilish 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.

13. 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.

14. 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

15. The rate of attenuation of a radio wave which occurs when the wave travels close to the Earths 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.

16. 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.

17. The frequency corresponding to a wavelength of 3.5 cm is:

A) 857 MHz. B) 85.7 MHz.C) 8.57 GHz. D) 8.57 MHz.

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

A) 16,67metres. B) 83,33metres.
C) 166,67metres. D) 8,33metres.

19. Due to Doppler effect an apparent decrease in the transmitted frequency, which is proportional to the transmitters velocity, will occur when:

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

20. 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.

21. The maximum range obtainable from an ATC Long Range Surveillance Radar is approximately:
A) 100 NM
B) 200 NM
C) 300 NM
D) 400 NM

22. Considering a primary radar system, what kind of aerials are used?
A) One directional antenna both for transmitting and for receiving
B) A directional antenna for transmitting, and an omni-directional antenna for receiving
C) One directional antenna for transmitting and one for receiving
D) An omni-directional antenna for transmitting, and a directional antenna for receiving

23. A frequency of airborne weather radar is:
A) 9375 MHz B) 9375 GHz C) 9375 kHz D) 93.75 MHz

24. On switching on the AWR a single line appears on the display. This means that:
A) the transmitter is unserviceable B) the receiver is unserviceable
C) the CRT is not scanning D) the antenna is not scanning

25. Which of the following is a complete list of airborne weather radar antenna stabilisation axes?
A) Roll, pitch and yaw B) Roll and pitch
C) Pitch and yaw D) Roll and yaw

26. The pencil shaped beam of an airborne weather radar is used in preference to the mapping mode for the determination of ground features:
A) when approaching coast-lines in polar regions
B) beyond 100 NM because insufficient antenna tilt angle is available with the mapping mode
C) beyond 150 NM because the wider beam gives better definition
D) beyond 50 to 60 NM because more power can be concentrated in the narrower beam

27. 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

28. In order to ascertain whether a cloud return on an Aircraft Weather Radar (AWR) is at or above the height of the aircraft, the tilt control should be set to: (Assume a beam width of 5°)
A) 2.5° up
B) 5° up

C) 0°
D) 2.5° down

29. On the AWR display the most severe turbulence will be shown:
A) in flashing red B) by a black hole
C) by a steep colour gradient D) alternating red and white

30. Which of the following lists phenomena that CANNOT be detected by weather radar?
A) Dry hail; clear air turbulence
B) Snow; clear air turbulence
C) Clear air turbulence; turbulence in cloud with precipitation
D) Snow; turbulence in clouds with precipitation

31. The airborne weather radar (AWR) cannot detect:
A) snow
B) moderate rain
C) dry hail
D) wet hail

32. 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

33. AWR in the ___ mode progressively ___ as distances ___ to equalise screen brightness
A) weather, decreases gain, increase
B) mapping, decreases power, decrease
C) weather, increases power, decrease
D) mapping, increases gain, decrease

34. Before commencing a flight the weather radar should:
A) be switched to stand-by but not used until airborne
B) not be switched on until clear of buildings
C) be switched to a range function after push back to make sure it is functioning
D) be kept at stand-by until line up with the runway

35. On a colour radar, a bright red echo indicates:
A) An area of strong wind shear
B) An area of extreme turbulence
C) Strong rising air currents

D) Heavy concentrations of liquid/solid water

36. The ground Secondary Surveillance Radar (SSR) equipment incorporates a transmitter and receiver respectively operating in the following frequencies (transmitter; receiver):
A) 1090 MHz; 1090 MHz
B) 1090 MHz; 1030 MHz
C) 1030 MHz; 1090 MHz
D) 1030 MHz; 1030 MHz

37. With SSR, interrogation and response signals:
A) are separated by 63 MHz
B) must be set by the pilot but are always 60 MHz apart
C) are at standard frequencies separated by 60 MHz
D) are at variable frequencies set by the controller but are always 63 MHz apart

38. With normal SSR mode A coding the aircraft replies by sending back a train of up to 12 pulses contained between 2 framing pulses with:
A) 4096 codes in 4 boxes
B) 2048 codes in 4 boxes
C) 4096 codes in 12 boxes
D) 1096 codes in 8 boxes

39. With regard to the advantages of SSR which of the following statements is correct?
A) Little power is required to effect longish range
B) No aircraft manoeuvres are necessary for identification
C) Range, bearing and height can be calculated from reply signals
D) All of the above

40. Which statement regarding Mode S transponders is most correct?
A) Mode S transponders reduce RT traffic and provide a datalink facility
B) Mode S transponders are used with TCAS III
C) Mode S transponders are used to assist GPS positioning
D) Mode S and Mode C transponders operate on different frequencies

41. In the SSR response, the operation of the transponder ident button:
A) transmits the aeroplanes registration or flight number as a data coded sequence
B) sends a special pulse after the normal response pulse train
C) sends a special pulse before the normal response pulse train
D) sends a special pulse in the X position on the pulse train

42. Garbling is caused by:

A) an aeroplane's transponder responding to side lobes or reflections of the interrogation signal
B) aeroplane is in close proximity responding to the same interrogation
C) aeroplane at range responding to interrogations from another ATC, SSR
D) Doppler effect on targets moving radially towards or away from the SSR

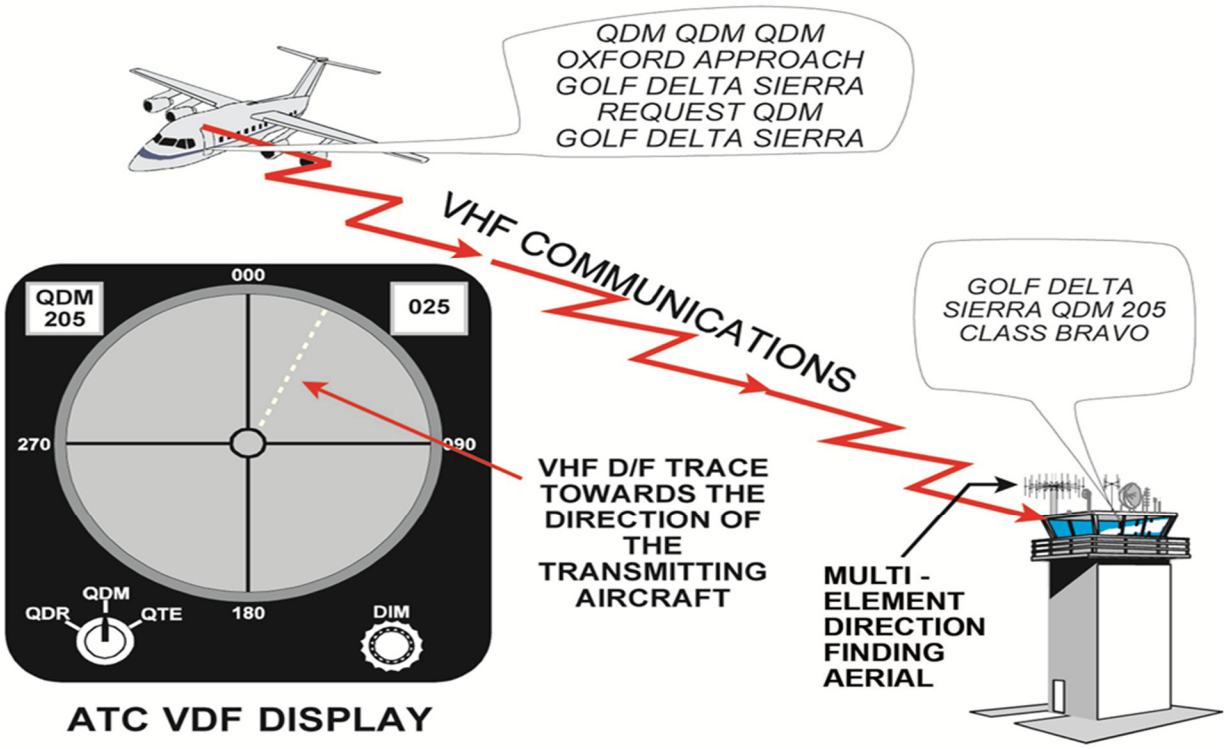
43. Fruiting is caused by:
A) Aeroplanes in close proximity responding to the same interrogation
B) An aeroplane's transponder responding to side lobes or reflctionsof the interrogation signal
C) Aeroplane at range responding to interrogations from another ATC, SSR
D) Doppler effect on targets moving radially towards or away from the SSR

44. The NAVSTAR/GPS segments are:
A) space, control, user
B) space, control, ground
C) space, control, air
D) space, ground, air

45. What is the inclination to the equatorial plane of the satellites orbit in the NAVSTAR GPS constellation?
A) 55°
B) 45°
C) 35°
D) 65°

PART B 20 MARKS

1. State and explain five factors that affect propagation of radio waves 10 marks



2. From the above diagram, explain what's meant by QDM, QDR, QTE 3 MARKS
3. What equipment is required on board the aircraft for the above procedure to be accomplished 1 mark
4. What's the accuracy of class A,B,C and D 4 marks
5. From the diagram above, what's the QDM of the aircraft to the ground station 1 mark
6. 

Using this CDI, what's the QDR shown 1 mark