City & Guilds
Multiple choice question paper

Paper number	Examination	Monday
7650-010	**Radio Amateurs**	**1 December 2003**
Series	Paper	**18 30 - 20 45**
December 2003	**Radio Amateurs' Examination**	**2¼ hours**

You should have the following for this examination

this question paper
an answer sheet
a pen with black or blue ink

you may refer to the attached schedule to help in answering any of the questions

MC

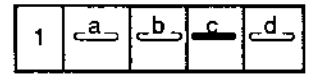
This question paper is the property of The City and Guilds of London Institute and is to be returned after the examination.

Read the following notes BEFORE you answer any questions.

- You MUST use a pen with black or blue ink to complete ALL parts of the answer sheet.
- Check that you have the correct answer sheet for the examination.
- Check that your name and candidate details have been printed correctly at the top of your answer sheet.
- Inform the invigilator if your name or examination details are not correct.
- Each question shows FOUR possible answers (lettered 'a', 'b', 'c' and 'd'); only ONE is correct.

  Decide which ONE is correct and mark your ANSWER SHEET with your PEN.

  For example if you decide 'c' is correct, mark your answer like this



  If you want to change your answer, cancel your first choice by filling in the lower half of the box like this  . Then mark the answer which you have now decided is correct.

- Any calculations or rough work can be done in this question paper.
- Attempt all questions. If you find a question difficult, leave it and return to it later.

This paper contains 80 questions. Answer them using the 'boxes' numbered 1 to 80 on the answer sheet.

See next page

1 What is the minimum time the Log must be retained?

a 3 months.
b 6 months.
c 9 months.
d 12 months.

2 The Amateur Radio (Full) Licence permits operation in the bands above 3.5 MHz and below 29.7 MHz with a maximum power level of

a 10 W (10 dBW)
b 32 W (15 dBW)
c 100 W (20 dBW)
d 400 W (26 dBW).

3 The maximum height above ground level that an aerial or supporting mast may be erected, within 1 km of the boundary of an aerodrome, is

a 12.5 m
b 15 m
c 60 ft
d 100 ft.

4 If an amateur radio operator whose call sign is G2ZZZ is operating from a temporary location in Wales, the operator must send

a G2ZZZ/M
b GW2ZZZ/T
c GM2ZZZ/A
d GW2ZZZ/P.

5 Effective Radiated Power (e.r.p.) is defined as the

a output power of a transceiver connected to a dummy load
b output power of a transceiver driving a linear amplifier connected to a dummy load
c product of the power supplied to the antenna and its gain in direction of maximum radiation
d difference between the power supplied to the antenna and its gain in the direction of maximum radiation.

6 Which one of the following is NOT a permitted activity for a Licensee?

a Receiving messages from overseas amateurs in non-UK bands.
b Using the Station for business or advertisement purposes.
c Operating to meet the needs of international disaster communications.
d Recording or retransmitting messages from other amateurs.

7 Which one of the following entries MUST be recorded in the Log?

a Date of transmission, class of emission and power.
b Date of transmission, exact frequency of transmission and power.
c Date of transmission, frequency band of transmission and received signal strength.
d Time in BST, frequency band of transmission and class of emission.

8 From which one of the following locations is a radio amateur NOT permitted to transmit?

a A hot air balloon.
b The platform of a railway station.
c A public bridleway.
d The public viewing area at an airport.

9 The conditions of the Amateur Radio Licence, as regards frequency control and measurement and undue interference, require that the Station shall have

a a satisfactory method of ensuring that the emitted frequency is as stable and as free from unwanted emissions as the state of technical development permits
b equipment capable of continuously monitoring that the sending apparatus is operating with emissions within the authorised frequency bands
c apparatus so designed and used that harmonics are attenuated to at least 40 dB below the fundamental frequency output
d frequency measuring equipment capable of measuring frequency to an accuracy of ±0.05%.

10 A radio amateur is licensed to transmit

a bulletins about the activities of a local football club
b remarks of a personal nature
c non-commercial recordings of music
d messages on behalf of a third party.

11 An amateur station log should be available for inspection by a person authorised by the

a Secretary of State
b Chief Inspector of any UK police force
c Postmaster General
d Minister of Posts and Telecommunications.

12 When operating Maritime Mobile, the Licensee must use the following suffix after the call sign

a /M
b /MB
c /MM
d /MA.

13 If the suffix P is NOT being used at a Temporary Location, the Licensee must

a have given prior written notice of the location to the Operations Manager of the RA local office
b have obtained written permission from the Secretary of State before setting-up the equipment
c use the suffix /T with his call sign
d use the suffix /M with his call sign.

14 Morse telegraphy by on-off keying without the use of a modulating frequency is designated by the symbols

a A1A
b F3E
c A2A
d F1A.

15 The call sign MOXYZ/M indicates that the Licence holder is operating

a from a temporary location in Scotland
b while Mobile
c from a temporary location in the Isle of Man
d while Maritime Mobile.

16 Under which one of the following conditions is mobile operation NOT permitted by the Amateur Radio Licence?

a Transmitting and receiving while walking.
b Operating from a boat on a lake or river.
c Using an amateur radio transceiver in a balloon.
d Operating while riding pillion on a motorcycle.

17 The maximum permitted p.e.p. output of a telephony transmitter operating in the 1.850 MHz to 1.950 MHz band is

a 10 dBW
b 15 dBW
c 20 dBW
d 26 dBW.

18 Which one of the following amateur bands has the lowest maximum permitted radiated power level?

a 0.1357 to 0.1378 MHz.
b 3.500 to 3.800 MHz.
c 70.00 to 70.50 MHz.
d 144.0 to 146.0 MHz.

19 After having established contact on the calling channel (frequency) of a v.h.f./u.h.f. amateur band, it is normal practice to

a continue on that channel
b move to a working channel
c change to a different mode
d move to a different band.

20 In an amateur radio station the Log

a must only contain entries required by the Licence
b must only contain entries relating to the signals sent or received by the Station
c should contain the contents of all messages sent or received by the Station
d may, in addition to entries required by the Licence, also be used as a record of operations of the Station.

21 The MAIN purpose of repeaters is to

a enable mobile and portable stations to communicate over long distances
b provide a priority channel for emergency services
c provide a means of traffic and weather information on motorways
d enable fixed stations to extend their range to neighbouring counties.

22 The Q code for 'change transmission to another frequency' is

a QRT
b QRV
c QSY
d QRS.

23 Observance by amateur radio stations of the h.f. Band Plan recommended by the International Amateur Radio Union (IARU)

a assists in ensuring the best use of the frequency bands available to amateurs
b is required by member countries of the ITU
c is recommended by the RA
d is only intended to assist in long distance h.f. contests.

24 The phonetic alphabet words for the letters K D O are

a Kilo Dog Ontario
b Kilowatt Delta Oscar
c Kenya Denmark Orange
d Kilo Delta Oscar.

See next page

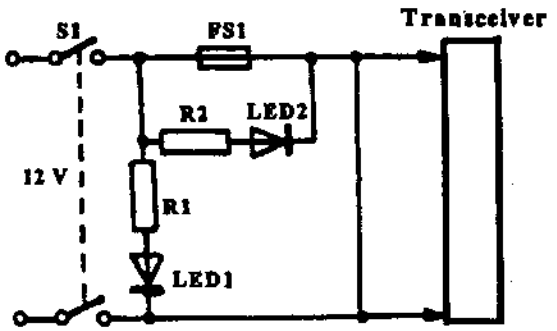


FIG. 1

25 A circuit has its input wired as shown in Fig. 1. If the fuse blows with S1 in the ON position

a LED1 and LED2 will both glow steadily
b LED1 will flash slowly and LED2 will glow steadily
c LED1 will not light and LED2 will flash slowly
d LED1 will glow steadily and LED2 will not light.

26 What value of capacitance is required with an inductance of 50 μH to resonate at 1.6 MHz?

a 20 pF
b 166 pF
c 200 pF
d 2000 pF

27 The impedance at resonance of a series tuned circuit containing inductance and capacitance is

a maximum
b minimum
c capacitive
d inductive.

28 A power transformer has a primary winding of 2000 turns and a secondary winding of 200 turns. If the secondary winding is supplying 100 W at 25 V, what current is flowing in the primary? (Assume losses to be negligible.)

a 2.5 A.
b 1.0 A.
c 0.8 A.
d 0.4 A.

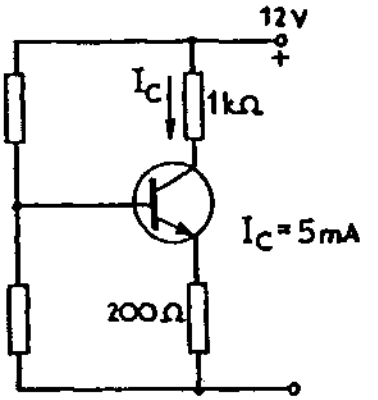


FIG. 2

29 Assuming the base current to be negligible, the power being dissipated in the transistor in the circuit shown in Fig. 2 is

a 25 mW
b 30 mW.
c 35 mW
d 60 mW.

30 If the power amplifier of a transmitter is operated in linear mode, the output waveform will

a be an amplified replica of the input waveform
b contain fewer harmonics than the input
c be generated with minimum d.c. power consumption
d only be suitable for use on CW telegraphy.

31 The peak inverse voltage rating of a diode is the

a peak value of the a.c. supply used with the diode
b maximum voltage drop across the diode when it is conducting
c maximum voltage across the diode when it is not conducting
d maximum d.c. output from the diode.

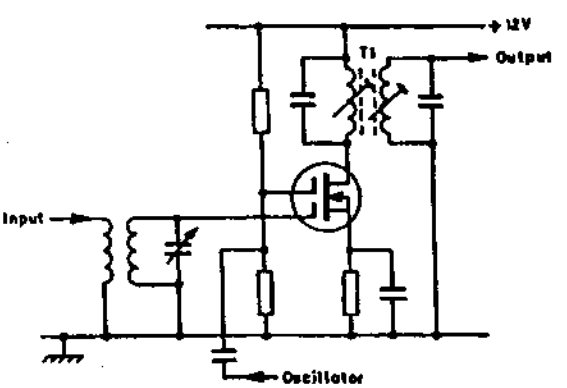


FIG 3

32 Fig. 3 shows the mixer stage of a typical superheterodyne receiver. What type of transistor is employed?

a Bi-polar NPN.
b Bi-polar PNP.
c Dual-gate MOSFET.
d Junction FET.

33 In the design of a superheterodyne receiver, a high first intermediate frequency is chosen to provide

a greater sensitivity to h.f. signals
b immunity from mains borne interference
c greater stability with varying temperatures
d greater immunity from second channel interference.

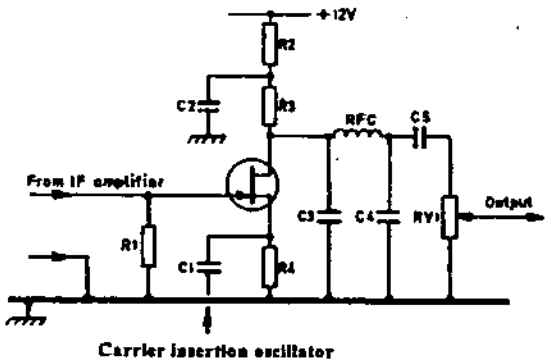


FIG. 4

34 Refer to the circuit diagram of a product detector shown in Fig. 4. What signal will appear at the output?

a I.F.
b A.F.
c Upper sideband.
d Lower sideband.

35 When the received signal level at the aerial input of a receiver increases, the a.g.c. system responds by

a reducing the sensitivity of the receiver
b increasing the sensitivity of the receiver
c reducing the bandwidth of the receiver
d increasing the bandwidth of the receiver.

36 When a phase lock loop is unlocked

a there is no output signal at any frequency
b the freqnency of the output will drift slowly
c the output power level will be much higher
d the output frequency will be uncontrolled.

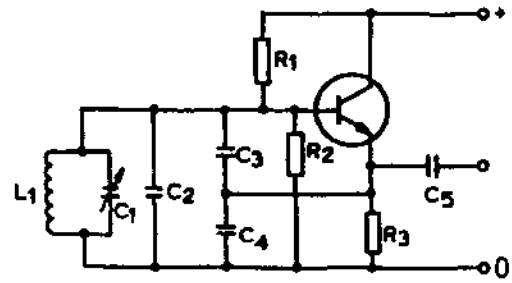


FIG. 5

37 Fig. 5 shows a Colpitts oscillator. The function of C_5 is to

a block d.c. and allow the r.f. signal to pass
b act as an emitter by-pass capacitor
c provide decoupling
d smooth the output.

38 A frequency modulated transmitter operates with a carrier frequency of 100 MHz. A 1 kHz tone causes the carrier frequency to vary between 99.9 MHz and 100.1 MHz, 1000 times per second. If the amplitude of the 1 kHz tone is now doubled, the carrier frequency will vary between

a 99.9 MHz and 100.1 MHz, 1000 times per second
b 99.9 MHz and 100.1 MHz, 2000 times per second
c 99.8 MHz and 100.2 MHz, 1000 times per second
d 99.8 MHz and 100.2 MHz, 2000 times per second.

39 A dummy load should NOT be

a made from inductive components
b used for tests above 30 MHz
c used with analogue power meters
d stored near magnetic fields.

40 One result of keying the oscillator of a transmitter could be

a chirp
b excessive deviation
c generation of harmonics
d increased output.

41 An r.f. drive level to a p.a. stage greater than that recommended

a is often necessary to achieve the specified maximum output power of a transmitter
b will normally result in frequency drift
c is necessary to increase the power output on long distance s.s.b. transmissions
d is likely to result in excessive harmonics being generated and transmitted.

See next page

42 Key clicks are caused by

a the use of an unstabilised power supply
b too wide a gap in the key contacts
c an unstable variable frequency oscillator
d short rise and fall times of the keyed waveform.

43 Spurious emissions

a can occur at any frequency and power level
b are always about 60 dB below the carrier level
c always occur within about 5 kHz of the carrier frequency
d are normally at least 3 dB above the power of the carrier wave.

44 Why is it desirable to limit the peak amplitude of the audio signal applied to an f.m. modulator?

a To minimise unwanted amplitude modulation.
b To provide pre-emphasis.
c To minimise excessive frequency deviation.
d To prevent harmonic radiation.

45 A transmitter is connected to a dummy load during off-air tests. The r.f. power in the dummy load is

a fed back to the transmitter
b radiated into the troposphere
c converted to magnetic energy
d dissipated as heat in the load.

46 The MOST undesirable effect of overmodulation is that it

a reduces transmitter output power
b causes the power amplifier to exceed its maximum ratings
c results in the generation of spurious sidebands
d causes the signal to be less readable.

47 The audio bandwidth of a transmitter should be limited in order to

a reduce transmitter power requirement
b prevent overmodulation
c make the most efficient use of the r.f. spectrum
d improve readability.

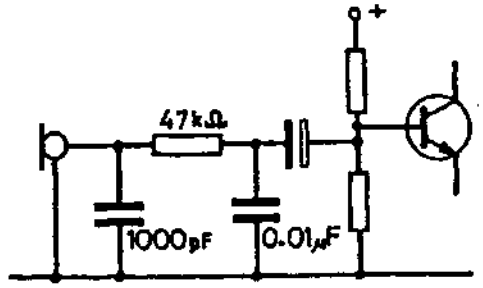


FIG. 6

48 The circuit shown in Fig. 6 would normally be used

a as a precaution against overmodulation
b to limit the modulating frequency range
c to match a crystal microphone to the amplifier input circuit
d to increase the high frequency response of the modulator.

49 Which one of the following types of tuned circuit will encourage minimum drift in an r.f. oscillator?

a High Q tuned circuit and heavy loading.
b Low Q tuned circuit and heavy loading.
c High Q tuned circuit and light loading.
d Low Q tuned circuit and light loading.

50 'Splatter' is interference that can be caused by

a an r.f. carrier being over-modulated
b poor frequency stability
c inadequate receiver sensitivity
d a motor vehicle with unsuppressed ignition leads.

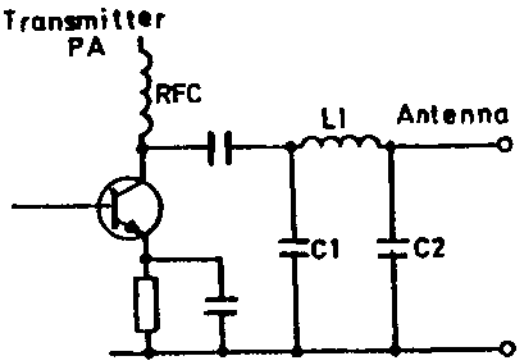


FIG. 7

51 A function of circuit components C1, L1 and C2 in Fig. 7 is to

a attenuate harmonic radiation from the transmitter
b prevent unbalance currents on the feeder
c ensure there is a d.c. path between the transmitter and the antenna
d prevent the d.c. supply to the power amplifier being shorted to earth.

52 A convenient means of measuring the frequency of a received signal would be to use

a an absorption wavemeter coupled to an antenna
b a receiver whose calibration can be checked against a crystal calibrator
c a digital frequency meter coupled to the receiver antenna
d a local transmitter to zero beat the incoming signal.

53 Which one of the following is NOT suitable for checking the frequency of an h.f. transmitter?

a Crystal heterodyne oscillator.
b Analogue multimeter.
c Digital frequency meter.
d Frequency synthesised h.f. receiver.

54 A braid breaker is used in a TV aerial downlead to minimise

a any high voltage signals from damaging the TV
b mains hum and noise from entering the TV
c radiation of local oscillator signals from the TV
d unwanted signals being picked up on the TV feeder.

55 R.F. signals can be rectified in audio amplifiers. In which one of the following places is rectification likely to occur?

a At the junction of a capacitor and a resistor.
b At a base-emitter junction in a transistor.
c In a low voltage polarised capacitor.
d In the collector lead of a transistor.

56 A home computer may cause interference

a only on the 'clock' frequency
b on a number of frequencies
c on all frequencies in the h.f. band
d on all frequencies in the v.h.f. band.

57 Which one of the following is MOST likely to produce continuous, broad-band interference?

a A tungsten filament bulb.
b A frequency modulated transmitter.
c A TV receiver ON/OFF switch.
d A fluorescent tube light.

58 Which one of the following modes of emission is LEAST likely to cause audio breakthrough to nearby audio equipment?

a Single sideband reduced carrier.
b Double sideband full carrier.
c Continuous wave telegraphy.
d Narrow band frequency modulation.

59 A transmission on the 28 MHz band is causing interference to a neighbour's TV reception. At what point should a braid breaker be fitted in order to have the greatest effect in minimising the interference?

a In the downlead 2.5 m from the TV aerial.
b In the downlead 5.0 m from the TV aerial.
c At the socket in the neighbour's living room.
d At the aerial input of the TV set.

60 S.S.B. transmissions are picked up on a nearby domestic audio system when it is being used to play CDs and tapes. A likely cure would be to fit a

a ferrite ring in the speaker leads as close to the audio unit as possible
b ferrite ring in the speaker leads as close to the speakers as possible
c ferrite ring in the centre of the speaker leads
d low value by-pass capacitor directly across the speaker terminals.

61 The neighbour of an amateur complains of interference on his TV picture when the amateur is transmitting. A test with the TV aerial disconnected shows that the interference then disappears. As a first step, the amateur could

a fit a mains filter to the TV receiver
b fit a filter in the TV aerial downlead
c change the TV aerial downlead
d suggest the use of a set top aerial.

62 It is good practice to keep a transmitting antenna away from mains wiring in order to minimise

a the standing wave ratio
b audio instability
c mains borne interference
d 50 Hz hum on the transmission.

See next page

63 A 50 Hz a.c. mains filter must

a offer high attenuation to the 50 Hz mains current
b offer a low impedance to all frequencies above 50 Hz
c offer a high impedance to all frequencies above 50 Hz
d be able to dissipate all of the 50 Hz power supplied to the station.

64 Short lengths of coaxial lead connect a transmitter to a v.s.w.r. meter and an antenna tuning unit. These leads must

a have their screen disconnected at one end
b have their screen disconnected at both ends
c be completely unscreened and not coaxial cable
d have their screen connected securely in the plugs at each end.

65 When an amateur receives a complaint of causing interference to a neighbour's television set, which one of the following is the BEST course of action for the amateur?

a Tell the neighbour that the television set is at fault.
b Refer the problem to a television dealer.
c Discuss a possible remedy with the neighbour.
d Refer complainant to the RA local office.

66 A mains transformer can reduce mains borne interference by having

a an earthed copper screen between the primary and secondary windings
b an earthed centre tap on the primary winding
c a paper capacitor connected between the primary and secondary windings
d a ferrous screen between the secondary winding and the earth.

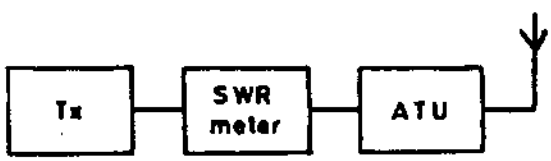


FIG. 8

67 The main purpose of the ATU in Fig. 8 is to

a reduce standing waves in the dipole antenna
b eliminate standing waves in the feeder
c present a resistive source to the feeder
d present a resistive load to the transmitter.

68 In a vertically polarised radio wave the magnetic component is

a suppressed
b horizontal
c in the same plane as the electric component
d vertical.

69 Night time propagation on 10 MHz from a station 5000 km distant is by

a groundwave
b ionospheric reflection
c skip
d tropospheric refraction.

70 Fading is caused when reflected waves arrive at the antenna

a in phase
b only by ground wave
c varying in phase relationship
d considerably later than the ground wave.

71 The physical length of a half-wave dipole for the 18 MHz band is approximately

a 8 metres
b 16 metres
c 18 metres
d 36 metres.

72 Most of the radiation from an antenna takes place from the

a half that is furthest from the ground
b part where the impedance is highest
c portion where maximum current flows
d point where the voltage is at its maximum.

73 A quarter wave matching stub for 50 MHz is made from 75 Ω coaxial cable having a 0.8 velocity factor. The length of the stub will be

a 0.8 metres
b 1.2 metres
c 2.4 metres
d 4.8 metres.

74 Which one of the following antennas is the MOST directional?

a End fed dipole.
b Skeleton slot.
c Yagi.
d Folded dipole.

75 Which one of the following statements about the internal resistance of meters is correct?

a A voltmeter has a high internal resistance and an ammeter has a low internal resistance.
b A voltmeter has a low internal resistance and an ammeter has a high internal resistance.
c Both voltmeters and ammeters have high internal resistance.
d Both voltmeters and ammeters have low internal resistance.

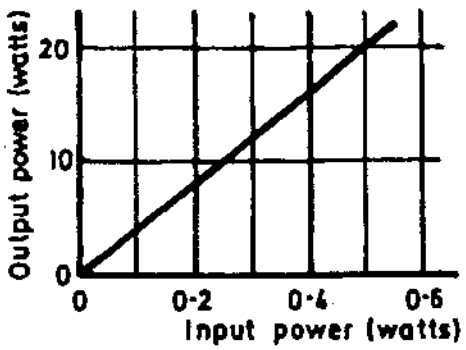


FIG. 9

76 Fig. 9 shows the power into and out of a linear amplifier. What is its power gain?

a 10.
b 20.
c 30.
d 40.

77 A transmitter power output stage has an operating efficiency of 60%. If its d.c. input power is 50 W, the output will be

a 40 W
b 30 W
c 20 W
d 8.3 W.

78 When checked against the Standard Frequency Service transmission on 20 MHz, the digital read-out of a transceiver indicates 19.998 MHz. If the transceiver is to be operated 5 kHz above the low frequency end of the 18 MHz band, what must appear on the digital read-out?

a 18.063 MHz.
b 18.071 MHz.
c 18.073 MHz.
d 18.075 MHz.

79 If a 50 Ω dummy load is required for a 20 W, 145 MHz transmitter, which one of the following would be BEST suited for this?

a Ten ½ W, 500 Ω carbon resistors in parallel.
b One 25 W, 50 Ω carbon resistor.
c Five 5 W, 250 Ω wirewound resistors in parallel.
d Two 10 W, 100 Ω wirewound resistors in parallel.

80 When using an oscilloscope to measure voltage it is necessary to check the range setting of the

a trigger level
b X amplifier
c timebase
d Y amplifier.

NOW GO BACK AND CHECK YOUR WORK

● **IMPORTANT —**

Are the details at the top of the answer sheet correct?

Have you filled in your answers in INK in the appropriate boxes on the answer sheet?