City & Guilds
Multiple choice question paper

Paper Number	Examination	
7650-010	**Radio Amateurs**	**Friday 05 April 2002**
Series	Paper	
April 2002	**Radio Amateurs' Examination**	**14 30 – 16 45 2¼ hours**

You should have the following for the 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

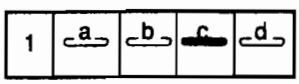
This question paper is the property of The City and Guilds of London Institute and is to be returned after the examination

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 on the 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 The holder of an Amateur Radio Licence may transmit telephony to

a relay the signals of the British Broadcasting Corporation
b broadcast news provided it is of amateur radio interest
c give traffic information to amateur stations in general when operating the station from a vehicle on a motorway
d exchange third party messages when requested by the police during an emergency exercise.

2 The Amateur Radio Licence (A) states that the Station may be used

a for self training in communication by wireless telegraphy
b to transmit recordings to other amateur stations
c to enable communication with foreign radio amateurs
d for self training in the construction of transmitters.

3 The holder of an Amateur Radio Licence (A) or (B) may receive messages from an overseas amateur on a frequency band not specified in the Schedule as long as the Licensee

a transmits on the same frequency as the received message
b transmits only in a band specified in the Schedule
c notifies the Secretary of State
d notifies the R.I.S.

4 Which one of the following is NOT an acceptable form of medium for a Log?

a A loose-leaf book.
b A bound book.
c Digital audio tape.
d Floppy disk.

5 Which one of the following is NOT a recognised user service?

a Automobile Association.
b St John Ambulance Brigade.
c British Red Cross Society.
d Chief Emergency Planning Officer.

6 Communication of a non-amateur kind is permitted on some amateur bands when there is

a overloading on undersea cables
b failure of communications satellites
c an international disaster
d civil unrest or strife.

7 Greetings messages may

a be sent by unlicensed persons under the direct supervision of the Licensee of an amateur radio station
b not be sent by unlicensed persons, even under the supervision of the Licensee of an amateur radio station
c not be sent by an unlicensed person unless he/she operates the transmitter and identifies the station
d be sent by unlicensed persons from a club station and may be from 5 to 15 minutes in length.

8 The class of emission F3E refers to

a telephony using frequency modulation (f.m.)
b telephony using phase modulation (p.m.)
c data using direct frequency shift keying of the carrier
d data using frequency shift keyed audio tone.

9 An amateur Licensee correctly transmits his call sign on first joining a net and again when he leaves the net 25 minutes later. What other requirement regarding the transmission of his call sign should he have observed during his time in the net?

a Transmitting his call sign when first contacting new participants in the net.
b Transmitting his call sign when 15 minutes had elapsed since it was last sent.
c Repeating his call sign each time it was his turn to speak to others in the net.
d Sending his call sign on c.w. at not more than 12 w.p.m. every 10 minutes.

10 In an amateur call sign the Regional Secondary Locator D refers to

a Guernsey
b Isle of Man
c Jersey
d England.

11 Which one of the following is NOT permitted in amateur radio messages?

a Digitised speech.
b Computer programs.
c Enciphered signals.
d Facsimile signals.

12 "A device which stores, in a readable form, complete messages, which are not to or from the Licensee, for retransmission on behalf of other licensed amateurs". Which TWO of the following does the above extract from the Licence describe?

1 Repeater.
2 Beacon.
3 Mailbox.
4 Bulletin board.

a 1 and 2.
b 1 and 4.
c 2 and 3.
d 3 and 4.

13 When operating a handheld transmitter on a vessel at sea, the operator MUST

a have an A class licence
b use the callsign of the vessel
c use callsign suffix /M
d have the vessel master's permission.

14 The holder of an Amateur Radio Licence (A)

1 must use a power not exceeding 400 W (26 dBW) when transmitting in the frequency bands 1.810 - 1.850 MHz and in the bands at or above 3.500 MHz and below 29.700 MHz

2 must use the maximum power specified in the Schedule on all bands above 29.700 MHz

3 may only transmit on those bands below 29.700 MHz

4 may transmit on all frequencies allocated to the Amateur Service.

a 1 and 3
b 1 and 4
c 2 and 3
d 2 and 4.

15 As well as being allowed to receive transmissions on amateur frequencies, amateurs are permitted to receive

a ambulance service messages
b standard frequency transmissions
c police service transmissions
d transmissions from mobile phones.

16 The Licensee shall pay the Licence fee on renewal

a before the fifth anniversary date of the Date of Issue
b before the anniversary date of the Date of Issue in each year
c within 28 days of the anniversary date of the Date of Issue in each year
d within 28 days of receipt of a request in writing.

17 Which one of the following frequencies is outside an authorised amateur band?

a 144.6 MHz.
b 145.7 MHz.
c 440.1 MHz.
d 1265.4 MHz.

18 Which one of the following bands is shared with other services?

a 144 - 146 MHz.
b 28 - 29.7 MHz.
c 7 - 7.1 MHz.
d 3.5 - 3.8 MHz.

19 After completing a contact with a station previously heard calling CQ, it is good practice for the answering station to

a call CQ on the same frequency
b transmit QRZ? on the same frequency
c allow the other station continued use of the frequency
d call CQ giving the call signs of both stations using the frequency.

20 If kept on a computer, the Amateur Station Log

a need not be retained for more than 3 months
b must show the exact frequencies of transmissions
c need not show details of unanswered CQ calls
d must have printout facilities available.

See next page

21 The main function of a repeater is to

a allow Novice Licensees to overcome the limitations of their low power
b increase the range of mobile stations
c provide accurate reports of road conditions
d establish transmissions of constant power for propagation studies and equipment testing.

22 The international Q code symbol used on telegraphy to indicate interference caused by other stations is

a QRA
b QRM
c QRN
d QSB.

23 Amateur radio station operators are expected to observe the h.f. band plans as recommended by the International Amateur Radio Union (IARU). Such observance is

a a requirement of the member countries of the International Telecommunication Union (ITU)
b aimed at reducing interference between competing stations in organised amateur radio contests
c a fundamental operating requirement in the Licence, as laid down by the Radiocommunications Agency
d intended to ensure the best possible use of that portion of the radio spectrum available to amateurs.

24 The callsign G2UFO in phonetics is

a Germany 2 uncle fox oboe
b Germany 2 uncle foxtrot oscar
c golf 2 uniform fox oboe
d golf 2 uniform foxtrot oscar.

25 Working on live mains equipment with one hand in a pocket

a is a strange, out of date practice
b is only necessary where capacitors are involved
c will ensure complete safety
d is an aid to reducing the likelihood of a fatal electric shock.

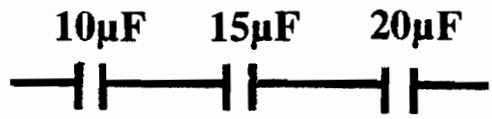


FIG. 1

26 The effective value of the three capacitors in Fig. 1 is

a 0.22 µF
b 4.6 µF
c 15.00 µF
d 45.00 µF.

27 A current of 5 A flows through the primary of a transformer which has a turns ratio of 5:1 primary to secondary. The current through its secondary will be approximately

a 25 A
b 10 A
c 5 A
d 1 A.

28 160 W is equivalent to

a 2.2 dBW
b 5.1 dBW
c 16 dBW
d 22 dBW.

29 The current gain of a common emitter amplifier is

a greater than one
b one
c less than one
d zero.

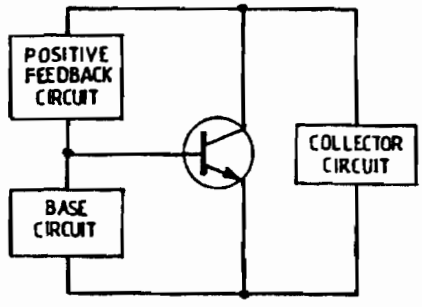


FIG. 2

30 For the oscillator shown in Fig. 2 to oscillate correctly the voltage fed back should have a phase shift

a of 0°
b of 180°
c of 270°
d depending on the type of oscillator.

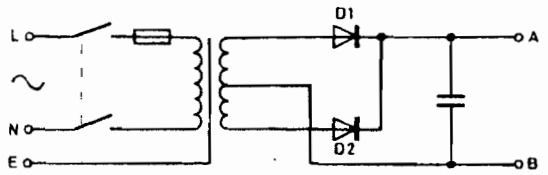


FIG. 3

31 Refer to Fig. 3. The voltage from the centre tap of the transformer to each side of the secondary winding is 10 V RMS. What is the approximate peak inverse voltage across each diode?

a 10 V.
b 14 V.
c 20 V.
d 28 V.

32 Which type of detector is normally used for the reception of s.s.b. transmissions?

a Envelope detector.
b Product detector.
c Ratio detector.
d Coherer.

33 A superheterodyne receiver has an intermediate frequency of 450 kHz and a local oscillator operating on the high side of the wanted signal. When tuned to 14200 kHz a strong image signal may be received having a frequency of

a 17595 kHz
b 15800 kHz
c 15100 kHz
d 11600 kHz.

34 The purpose of a discriminator in an f.m. receiver is to

a limit the peaks of incoming signals
b attenuate signals on adjacent channels
c demodulate the incoming signal
d reduce the bandwidth.

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 Which stage of a receiver affects its frequency stability?

a Product detector.
b R.F. amplifier.
c Local oscillator.
d Ratio detector.

37 The MAIN purpose of a buffer stage in a high frequency transmitter is to

a provide amplification to drive fully the power amplifier stage
b multiply the frequency from a crystal oscillator
c reduce the presence of harmonics
d prevent interaction between stages of the transmitter.

38 Which one of the following is the MOST suitable position to key a low power morse transmitter?

a Oscillator emitter.
b Supply to the whole transmitter.
c Emitter of the p.a. stage.
d Antenna lead.

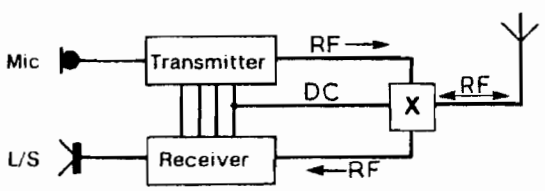


FIG. 4

39 Fig. 4 shows the block diagram of a radio transceiver. What is block X?

a A standing wave ratio meter.
b A modulation monitor.
c A coaxial changeover relay.
d A 50 Ω re-radiation suppressor.

40 An amateur transmitter operating lower sideband is tuned to a frequency of 7.098 MHz. If the transmitter drifts 3 kHz high

a third harmonic distortion will occur
b fifth harmonic distortion will occur
c the transmission will still be inside the allocated band
d out of band operation will take place.

See next page

41 In an amateur transmission it is desirable to restrict the bandwidth of an emission in order to

a prevent the radiation of parasitic oscillations
b reduce the level of the third harmonic
c prevent the power amplifier stage being over-driven
d minimise interference with adjacent channels.

42 The MOST likely result of overdriving the valve p.a. stage of a transmitter is the

a production of high levels of background noise on the transmitted signals
b emission of harmonics
c emission of sub-harmonics
d production of reduced signal bandwidth.

43 An s.s.b. transmitter is being overdriven and is causing splatter to stations operating on adjacent channels. One possible method of minimising the problem is to

a move to a higher frequency
b reduce the microphone gain
c fit a low pass filter in the antenna
d fit a high pass filter in the antenna.

44 The purpose of a two-tone test is to

a check access to a repeater station
b occupy a free channel before transmission
c provide station identification
d check the operation of s.s.b. linear amplifiers.

45 The output frequency of a transmitter has a noticeable amount of drift. Which stage or stages of a transmitter cause drift?

a The carrier oscillator.
b The multiplier stages.
c The mixer stages.
d The p.a. stage.

46 Which one of the following types of spurious signals, heard on a receiver, is caused by poor receiver design?

a Parasitic oscillation.
b Chirps.
c Sideband splatter.
d Image interference.

47 When using a general coverage receiver for checking for spurious emissions it is possible to be misled by

a spurious responses within the receiver
b spurious responses external to the receiver
c carrier drift within the transmitter
d carrier drift within the receiver.

48 Which one of the following classes of amplification is MOST likely to produce harmonics when used in the p.a. stage of a transmitter?

a Class A.
b Class AB.
c Class B.
d Class C.

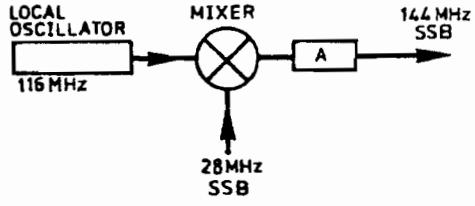


FIG. 5

49 Refer to Fig. 5 which shows a block diagram of a transmitter mixer. Which one of the following circuit elements is essential at point A?

a Buffer amplifier.
b Bandpass filter.
c Linear amplifier.
d Low pass filter.

50 One advantage of using an antenna tuning or matching unit with a transceiver is that

a it provides attenuation of harmonics in the transmitter output
b it prevents blocking of the receiver by strong, in band signals
c the receiver is isolated from the transmitter output
d the transmitter signal will not cause interference to other systems.

51 The reason for restricting the audio bandwidth in a transmitter's modulator to 3 kHz is to

a prevent the p.a. from overheating
b prevent excessive sidebands
c produce 'broadcast quality' audio
d keep power output within limits.

52 Chirp is a form of frequency instability that results from

a poor regulation in the power supply of a receiver
b over-modulation of an s.s.b. transmitter
c variation of oscillator frequency during keying
d over-deviation of a frequency modulated signal.

53 The simplest piece of equipment that may be effectively used to check correct selection of the required harmonic signal in the output of a frequency multiplier stage is

a a diode radio frequency probe
b an absorption wavemeter
c a digital frequency meter
d a multimeter on an a.c. range.

54 An amateur transmitter is causing severe radio frequency patterning with a tendency for some speech breakthrough on all television channels on a nearby television receiver. It has a roof-mounted Yagi aerial feeding a wide-band amplifier in the television downlead. The interference is MOST likely due to

a harmonics of the television local oscillator mixing with the transmitter to produce an intermediate frequency
b poor earthing of the transmitter power supply and aerial system
c cross modulation at the television aerial amplifier input due to signal overloading
d audio pickup in the television loudspeaker leads.

55 Unmodulated r.f. carrier pickup in the i.f. stages of a TV receiver often produces

a variations in the e.h.t. level
b channel selection changes
c patterning on the TV screen
d a buzz on the audio output.

56 The computer used in an amateur radio station is MOST likely to interfere with the operation of the

a station receiver
b station transmitter
c v.s.w.r. meter and antenna tuning system
d absorption wavemeter.

57 Digital circuitry containing a crystal clock oscillator is likely to generate

a many harmonics of the fundamental clock frequency
b a very narrow band of interference
c sub-harmonic interference
d no interference.

58 A transmission on the 28 MHz band is causing interference to a neighbour's TV reception. The TV installation consists of a roof-mounted TV aerial, a coaxial down lead terminating in a socket in the neighbour's living room and a 3m long lead to the TV set. 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.

59 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.

60 What is the recommended way to minimise interference getting into the speaker leads of a Hi-Fi system?

a Connect a capacitor in series with the speaker.
b Wrap a few turns of the speaker lead around a ferrite ring.
c Use a balun transformer.
d Change the impedance of the speakers.

61 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.

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antenna. Which one of the following methods will help reduce e.m.c. problems?

a Moving the antenna closer to the wall.
b Moving the antenna from indoors to outdoors.
c Reducing the antenna's height above ground.
d Using low-loss feeder.

63 In a valve linear amplifier a π-network is used to reduce harmonic radiation. It acts as a

a low-pass filter
b band-pass filter
c band-stop filter
d high-pass filter.

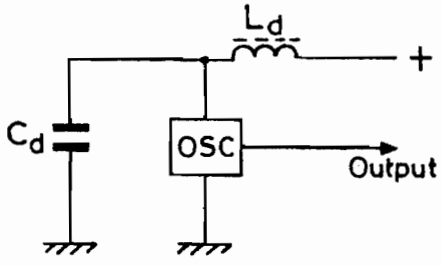


FIG. 6

64 Refer to Fig. 6. Components C_d and L_d have been included in the circuit to

a provide a linear, harmonic free, output signal
b eliminate the third harmonic of the oscillator output
c reduce the harmonic interference generated by the oscillator
d attenuate rf currents on the power supply line.

65 Reception of a transmission from a moving car has a whine on the audio signal which seems to vary with engine speed. The cause is most likely to be

a mobile flutter
b alternator breakthrough
c poorly suppressed sparkplugs
d the transmitter not being matched to antenna.

66 Breakthrough of v.h.f. signals to a transistor audio amplifier can be minimised by fitting a

a ferrite bead on a transistor base lead
b ferrite bead on a transistor collector lead
c 1 nF capacitor between a transistor base and collector
d 1 nF capacitor between a transistor emitter and collector.

67 When installing a transceiver in a vehicle

a use only copper fixing bolts to reduce intermodulation effects
b use a coaxial feeder with a soft iron centre conductor
c route the transceiver and antenna cables as far as possible from the vehicle wiring
d connect the transceiver directly to the engine control microprocessor.

68 The electric and magnetic components of a radio wave in space are at

a 0 degrees to each other
b 45 degrees to each other
c 90 degrees to each other
d 180 degrees to each other.

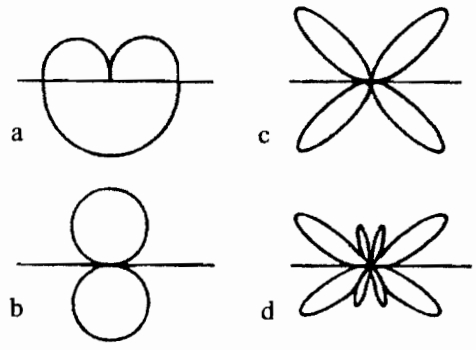
69 In tropospheric propagation of radio waves, the signals are

a reflected from ionised layers in the atmosphere
b bent back to earth by refraction in the atmosphere
c reflected by ice particles in high-altitude clouds
d bent back to earth by the effects of gravity.

70 A period of maximum sunspot activity recurs every

a 8 minutes
b 27 days
c 1 year
d 11 years.

71 Which is the radiation pattern for an antenna one wavelength long?



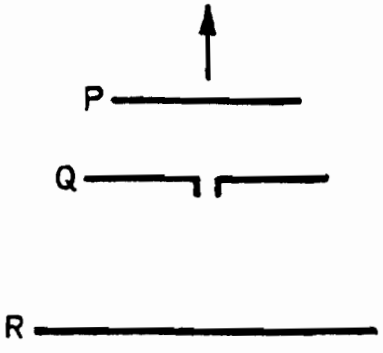


FIG. 7

72 Fig. 7 shows a 3-element Yagi antenna. Element P is the

a director
b rejector
c reflector
d acceptor.

73 The reason why an r.f. transmission line should be correctly matched at the transmitter end and at the antenna end is to

a prevent frequency drift
b ensure that the radiated energy is correctly polarised
c overcome fading of the transmitter signal
d transfer the maximum amount of power to the antenna.

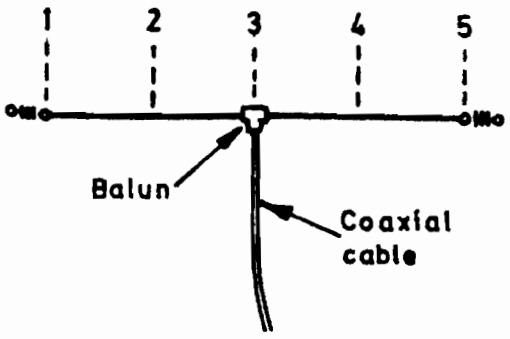


FIG. 8

74 Fig. 8 shows a half-wave dipole antenna. At which point(s) along its length will the maximum r.f. voltage occur?

a 1 and 5.
b 2 and 4.
c 3.
d 1, 3 and 5.

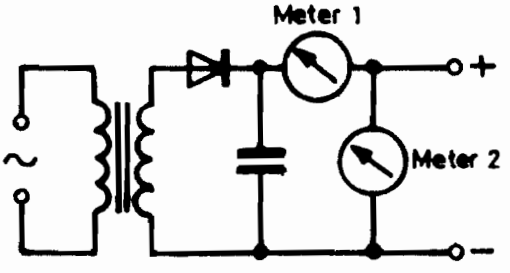


FIG. 9

75 The half-wave power supply in Fig. 9 contains two meters. What type of meter is each?

	Meter 1	Meter 2
a	Voltmeter	Voltmeter.
b	Voltmeter	Ammeter.
c	Ammeter	Voltmeter.
d	Ammeter	Ammeter.

See next page

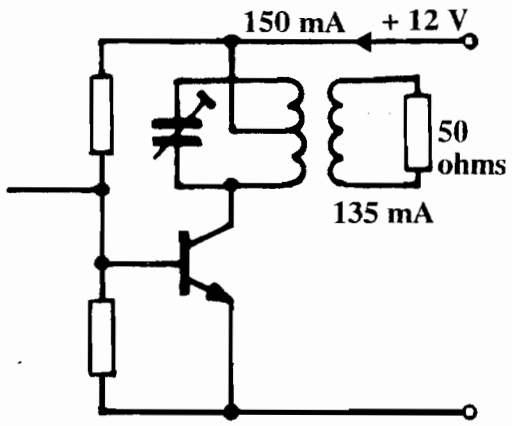


FIG. 10

76 In Fig. 10 the efficiency of the stage is

a 40%
b 45%
c 50%
d 55%.

77 A single sideband transmitter is adjusted for an output of 24 dBW. The output is then reduced by 6 dB. The new power output is

a three-quarters of the original power output
b a half of the original power output level
c a third of the original power output level
d one quarter of the original power output.

78 Which one of the following would measure accurately the radiated frequency of the station transmitter?

a Digital multimeter.
b Analogue multimeter.
c Absorption wavemeter.
d Digital frequency meter.

79 During initial tuning up of a transmitter, its output should be connected to

a a dummy load
b a local earth
c an antenna
d an s.w.r. meter.

80 Which one of the following can be used for measuring the frequency of an audio oscillator?

a R.F. voltmeter.
b Oscilloscope.
c Digital multimeter.
d Analogue multimeter.

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?