City & Guilds
Multiple choice question paper

Paper number	Examination	Monday
7650-010	**Radio Amateurs**	**8 May 2000**
Series	Paper	**18 30 - 20 45**
May 2000	**Written**	**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

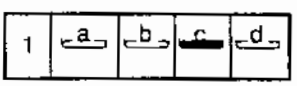
This question paper is the property of The City and Guilds of London Institute and is to be returned after the examination.

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.

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

See next page

1 Which one of the following designates a class of licence issued by the Secretary of State for amateur radio transmission?

a M.
b G.
c P.
d A.

2 An amateur radio station may be used for sending messages

a on behalf of any member of the public
b for any social organisation
c relating to the Armed Forces
d on behalf of the British Red Cross Society.

3 Which one of the following callsigns indicates that it is being used by a club station located in England?

a MC0XYZ.
b ME0XYZ.
c MM0XYZ.
d MX0XYZ.

4 The holder of any Amateur Radio Licence may transmit

a music
b public broadcasts
c a full post code
d speeches.

5 The Amateur Radio Licence states that the Licensee shall conduct tests for radiation of harmonics and other spurious emissions and record such tests in the Log

a once a month
b once every three months
c at the request of an officer of the RA
d from time to time.

6 Amateur Radio Licences may be revoked by

a a notice cancelling all amateur licences appearing in a magazine
b a general notice cancelling all amateur licences broadcast nationally by the British Broadcasting Corporation
c an instruction from the RSGB
d a letter from the local Chief Constable.

7 An amateur station MUST be capable of receiving messages

a in the Standard Frequency Service
b on all bands with a Primary status in the Schedule to the Licence
c on all bands with a Secondary status in the Schedule to the Licence
d on the same frequencies and with the same classes of emission in use for transmission.

8 If an Amateur Radio Licence is held on behalf of a club, greetings messages may be sent by non-licensed persons provided that

a these messages are sent and received to and from stations in countries which have implemented CEPT Recommendation T/R 61/01
b each person sends only one such message to each station with which the station is in contact
c each greetings message does not exceed six minutes
d it is under the direct supervision of any holder of an Amateur Radio Licence (A) or (B).

9 When notifying the Secretary of State of any change in the Main Station Address, the Licensee should write to the

a Department of Trade and Industry
b Home Office
c Post Office Customer Management Ltd
d Radio Investigation Service.

10 The Licensee shall pay to the Secretary of State the 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 from the Secretary of State.

11 To which one of the following countries are greetings messages permitted to be sent by a non-licensed person to an amateur station?

a Pitcairn Island.
b Bermuda.
c South Africa.
d France.

12 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 the direction of maximum radiation
d difference between the power supplied to the antenna and its gain in the direction of maximum radiation.

13 Where the Log is maintained on a disk

a the disk shall be used only to keep the Log
b a handwritten Log must also be kept
c it may only be used during contests
d it must be sent to the Secretary of State every six months.

14 The Amateur Radio Licence states that the apparatus comprised in the Station shall be so designed, constructed, maintained and used that the use of the Station does not cause

a any interference to any other electronic apparatus
b interference to government radio stations using the same band
c any undue interference to any wireless telegraphy
d interference to the local broadcast radio and television stations for the area.

15 The Licensee may use the station for non-pecuniary activities on behalf of a

a registered political organisation
b non-profit-making organisation for the furtherance of amateur radio
c religious organisation
d profit-making social organisation.

16 An absorption wavemeter for checking spurious emissions must

a have a dial calibrated to an accuracy of ±1%
b have a frequency coverage extending up to at least the second harmonic
c always be checked against a crystal calibrator
d have a built-in amplifier so as to detect any very weak emissions.

17 Amateur Radio Licence holders may operate in the 51.00 - 52.00 MHz at power levels not exceeding

a 26 dBW
b 22 dBW
c 20 dBW
d 15 dBW.

18 The use of telephony in the 10 MHz band is NOT recommended because

a the band is only 50 kHz wide
b it is not permitted by the ITU
c it is not permitted by the RA
d propagation conditions are always poor.

19 It is good operating practice when using Morse telegraphy that the speed of sending should be

a 12 w.p.m.
b the maximum speed at which the operator is capable of sending correctly
c the lowest speed at which replies can be expected
d the speed at which the calling operator is prepared to receive.

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 A v.h.f. satellite CANNOT be used

a before it appears over the horizon
b when it is directly overhead
c without a Notice of Variation issued by the Radiocommunications Agency
d without a Notice of Variation issued by the Radio Society of Great Britain.

22 Q codes

a are an internationally recognised form of telegraphic abbreviations
b are for use on the air only and should not be entered in the Log
c should be used wherever possible in both telegraphy and telephony
d should be spelt out by the phonetic alphabet if used in telephony.

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 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.

See next page

25 When working on the equipment in an amateur radio station, the operator should

a be isolated from earth by a rubber mat or other insulation
b maintain a good earth connection to the body
c maintain a headphone watch to ensure that no interference is being caused to other stations
d use a wandering earth lead held firmly in the hand.

26 Alternating current of a pure sine waveform has an r.m.s. value of 2 A. This has the same heating effect as

a 2 A, d.c.
b 4 A, d.c.
c 1 A, average value, a.c.
d 4 A, peak value, a.c.

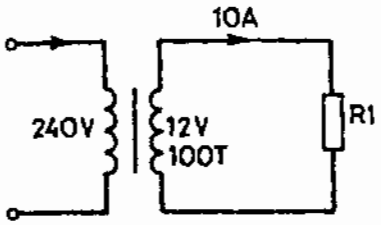


FIG. 1

27 In Fig. 1, if the current through the resistor R1 is 10 A, the current in the primary is

a 50 mA
b 500 mA
c 1 A
d 5 A.

28 0 dBW is equivalent to a power of

a 0.01 W
b 0.1 W
c 1 W
d 10 W.

Questions 29 and 30 refer to Fig. 2.

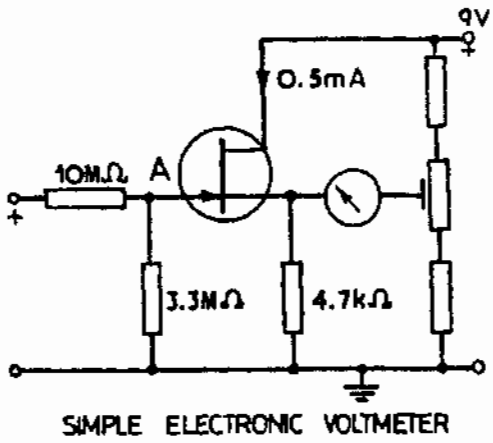


FIG. 2

29 In Fig. 2 point A on the active device is the

a gate
b emitter
c source
d drain.

30 What type of transistor is used in the circuit shown in Fig. 2?

a NPN.
b PNP.
c JFET.
d JUGFET.

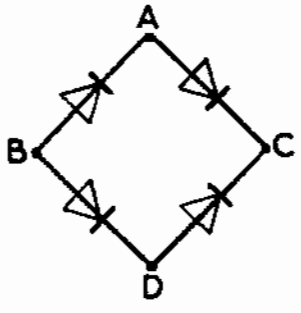


FIG. 3

31 Fig. 3 shows four diodes connected to form a bridge rectifier. An electrolytic smoothing capacitor should be connected to the circuit with its

a positive terminal to A, negative terminal to D
b positive terminal to B, negative terminal to C
c positive terminal to C, negative terminal to B
d positive terminal to D, negative terminal to A.

32 The mixer in a superhet receiver converts the wanted signal to the

a audio frequency
b intermediate frequency
c local frequency
d radio frequency.

33 A frequency modulated (f.m.) signal is normally demodulated by a

a product detector
b ratio detector
c phase modulator
d carrier insertion oscillator.

34 On a frequency modulated signal, variation of the carrier occurs

a only in amplitude
b in both amplitude and frequency
c only in frequency
d in both phase and amplitude.

35 The control voltage for applying automatic gain control is

a proportional to the frequency deviation
b obtained by rectifying part of the local oscillator output
c derived from a voltage divider across the d.c. supply
d obtained by rectifying the i.f. output.

36 A negative temperature coefficient capacitor incorporated in the resonant circuit of a variable frequency oscillator, will compensate for

a decrease in capacitance of the base circuit
b increase in the inductance of the coil
c increase in the base current
d decrease in the inductance of the coil.

37 Which one of the following actions will substantially increase the r.f. power output of an amateur station?

a Increasing the d.c. supply voltage to the power amplifier from 12 V to 13.5 V.
b Improving the s.w.r. of the antenna system.
c Improving the filtering of the d.c. supply.
d Adding an external linear power amplifier.

38 One advantage of keying the buffer stage in preference to the oscillator in a transmitter is that

a high r.f. voltages are not present
b changes in oscillator frequency are less likely
c key clicks are eliminated
d the radiated bandwidth is restricted.

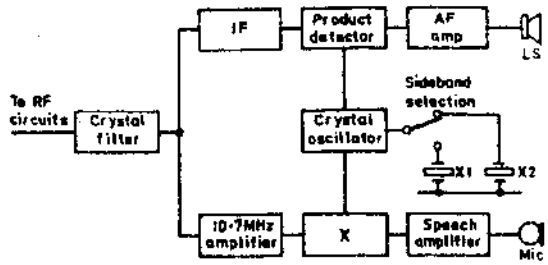


FIG. 4

39 Refer to the block diagram of a portion of an s.s.b. transceiver shown in Fig. 4. The block marked X is

a a balanced modulator
b an i.f. amplifier
c a buffer
d a v.f.o.

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.

41 The radiation of harmonics from an amateur transmitter may be caused by

a the power amplifier stage being over-driven
b keying a high current circuit in the transmitter
c the power supply to the driver stage being unregulated
d r.f. being induced in the mains supply to the transmitter.

42 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.

43 Frequency chirp in a c.w. transmitter is often due to

a fast rise time of carrier envelope
b poor power supply regulation
c radio frequency feedback
d thermal expansion.

44 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.

See next page

45 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.

46 Overmodulation is undesirable because 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 unreadable.

47 Which one of the following harmonics from a two metre amateur transmitter would fall in the TV band 471.21 MHz – 853.25 MHz?

a 2nd harmonic.
b 3rd harmonic.
c 5th harmonic.
d 7th harmonic.

48 A low-pass filter following the power amplifier in a single sideband transmitter is designed to minimise

a distorted audio
b frequency drift
c splatter
d transmitter harmonics.

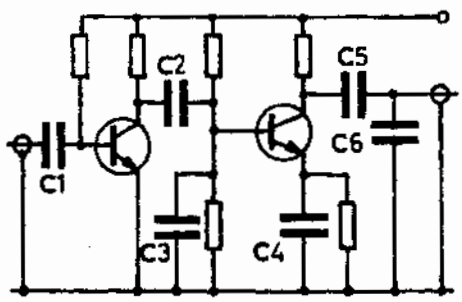


FIG. 5

49 Refer to Fig. 5 which shows a microphone amplifier. Which one of the following capacitors should be increased in value in order to attenuate the higher audio frequencies?

a C2 and C3.
b C3 and C6.
c C3 and C4.
d C4 and C6.

50 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.

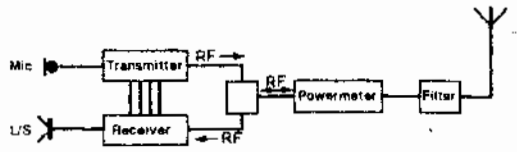


FIG. 6

51 Fig. 6 shows the block diagram of a typical two metre amateur transceiver. A suitable filter will be a

a 28 MHz low-pass filter
b 200 MHz high-pass filter
c 144 – 146 MHz band-pass filter
d 144 – 146 MHz band-stop filter.

52 To verify that a transmitter which is not crystal controlled is operated within the authorised frequency bands, a wavemeter is necessary which must be

a the station receiver
b an absorption type
c based on a crystal oscillator
d capable of covering twice or preferably three times the radiated wavelength.

53 The basic accuracy of a digital frequency counter is determined by the

a number of digits displayed
b accuracy of the prescaler
c internal oscillator
d counting period.

54 An amateur transmission is causing slight patterning on the screen of a nearby TV receiver. How can it be proved that the interfering signal is entering via the TV aerial system?

a Remove the mains plug from the socket.
b Disconnect the time base of the TV receiver.
c Unplug the TV aerial and terminate the TV aerial socket with a screened 75 Ω termination.
d Unplug the TV aerial and terminate the TV aerial socket with a 1 m length of open wire feeder.

55 When a TV receiver experiences an e.m.c. problem due to high field strength from an amateur transmitter, the problem may be reduced by

a decreasing the separation between the transmit antenna and the TV receiver
b increasing the separation between the transmit antenna and the TV receiver
c reducing the path loss between the transmit antenna and the TV receiver
d using a very low loss feeder on the transmitter antenna system.

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

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

57 An amplitude modulated emission having a wider bandwidth than necessary would

a produce distorted signals at the receiver
b be seriously undermodulated
c cause adjacent channel interference
d cause image interference in superheterodyne receivers.

58 A transmission in the 7 MHz band is causing interference to a TV receiver. A likely point of entry to the television, for the unwanted interference is via

a the loudspeaker lead
b its IF stage being tuned to 21 MHz
c the braid of the coaxial cable aerial feeder
d the mains earth lead.

59 When transmitting on the 28 MHz band, interference is caused to a neighbour's TV reception. The TV installation consists of a roof-mounted TV aerial, a coaxial downlead terminating in a socket in the neighbour's living room and a 3 m 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.

60 Slight patterning is observed on a nearby TV receiver when a local amateur v.h.f. transmitter is being operated. A preliminary investigation reveals that the TV is receiving a weak signal, indicated by a snowy picture. What is the FIRST course of action?

a A complete realignment of the TV receiver.
b Replace the front end transistors in the TV receiver.
c Increase the power of the amateur transmitter.
d Check the TV aerial alignment, the feeder, and the feeder connections.

61 Severe interference from a nearby out-of-band transmitter can be reduced by fitting in the receiver antenna lead

a an untuned radio frequency amplifier
b an isolating ferrite balun
c a static discharge device
d a band-pass filter.

62 RF energy entering the public mains supply from a transmitter can be minimised by using

a a long mains flexible cord
b a filter on transmitter mains supply leads
c an isolating mains transformer
d a common earth lead.

63 A balanced screened feeder can he made by using

a one length of coaxial cable
b two lengths of coaxial cable with the inner conductors joined at both ends
c two lengtbs of coaxial cable with screens joined at both ends and grounded at the a.t.u. The inner conductors are connected separately at the a.t.u. and at the antenna
d two lengths of coaxial cable with the inner conductors grounded and screens connected separately to the a.t.u. and antenna.

64 An amateur h.f. transmission is induced into the mains supply. What is the MOST likely cause?

a The antenna feeder is situated too close to the mains wiring.
b Incorrect mains fuses fitted at the transmitter input.
c The mains supply line impedance is too low.
d The transmitter is using a transformer with a copper screen between primary and secondary.

65 To reduce the level of mains-horne interference in a receiver, a Faraday shield may be used. This will take the form of a

a metal screen around the receiver
b metal screen between primary and secondary of mains transformer
c metal screening between power supply and receiver circuitry
d metal can placed over the coils.

See next page

66 When investigating interference to a local television receiver what should be checked?

a The current rating of the receiver mains cable.
b The braid connection at the coaxial plug.
c The fuse rating of the mains plug for the receiver.
d The diagonal length across the receiver screen.

67 The length of one side of a quad antenna for the 20 metre band is approximately

a 5 m
b 10 m
c 15 m
d 20 m.

68 In a horizontally polarised electromagnetic wave the direction of the magnetic field is

a along the line of propagation
b against the line of propagation
c at right angles to the line of propagation and horizontal
d at right angles to the line of propagation and vertical.

69 Long distance communication on frequencies above 50 MHz may be caused by

a refraction in the troposphere
b increased ionisation of the F-layer
c an extension of the ground wave
d low atmospheric pressure.

70 When signals from a distant station arrive at a receiving antenna by two paths

a the total signal strength is increased by the product of the signals by the two paths
b the two signals cancel leaving no signal at the receiver
c fading is produced by the signals arriving hy the two paths falling in and out of phase with each other
d signals remain constant in strength but are severely distorted.

71 A radio wave having a wavelength of two metres has a frequency of

a 150 kHz
h 2 MHz
c 15 MHz
d 150 MHz.

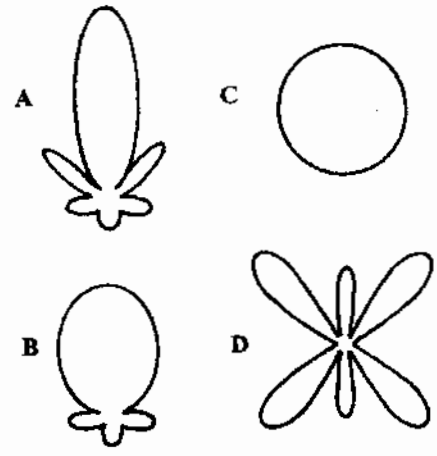


FIG. 7

72 Refer to Fig. 7. Which is the polar diagram of a high gain antenna?

a A.
b B.
c C.
d D.

73 A stub is connected across an antenna feed point to

a match the feed point impedance
b correct the reactive part of the feed point impedance
c prevent flash-over at voltage maxima
d avoid the need for a quarter-wave transformer.

74 A standing wave ratio meter is normally used when adjusting

a an antenna tuning unit
b a 1 to 1 balun
c a high-pass filter
d a band-pass filter.

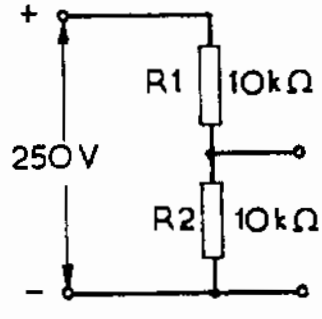


FIG. 8

75 Refer to Fig. 8. When using a multi-range meter to measure the voltage across R2, the MOST suitable range would be

a 0 - 100 V (a.c.)
b 0 - 100 V (d.c.)
c 0 - 250 V (a.c.)
d 0 - 250 V (d.c.).

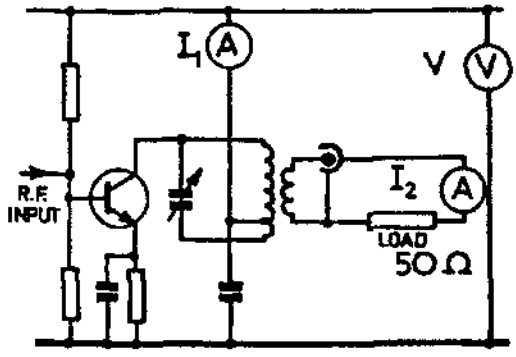


FIG. 9

76 Fig. 9 shows the power amplifier stage of a low power transmitter connected to a dummy load of impedance 50 Ω. If the meter readings are I_1 = 1 A, I_2 = 0.5 A, V = 20 V, the power output from the transmitter is

a 8 W
b 10 W
c 12.5 W
d 20 W.

77 If the r.f. power output from a transmitter is doubled, the gain in output will be

a 1 dB
b 3 dB
c 5 dB
d 6 dB.

78 One effect of adding a director and a reflector to a dipole is to

a decrease the impedance at the centre of the dipole
b increase the impedance at the centre of the dipole
c increase the angle of radiation
d decrease the directivity.

79 The main component in a dummy load is

a a non-inductive resistor
b a wire-wound resistor
c an inductor
d a variable capacitor.

80 The time base of an oscilloscope is set to 10 µs/cm. On displaying a sine wave, adjacent positive peaks are 2.5 cm apart.
The frequency of the waveform is

a 25 kHz
b 40 kHz
c 25 MHz
d 40 MHz.

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?

