City & Guilds
Multiple choice question paper

Paper number	Examination	Monday
7650-003/004	**Radio Amateurs**	**7 December 1998**
Series	Paper	18 30 - 20 45
December 1998	**Written**	**2¼ hours**

You should have the following for this examination
this question book
two answer sheets
an HB pencil

You may refer to the attached Schedule to help in answering any of the questions

MC

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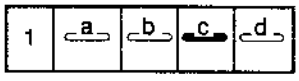
Read the following notes BEFORE you answer any questions.

- You MUST use an HB PENCIL to complete ALL parts of the answer sheet.
- 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 HB pencil.

  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 book.
- 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 25 (Part A) and 1 to 55 (Part B) on separate answer sheets.

See next page

Part A

Licensing Conditions and Operating Procedures

Answer questions 1 to 25 on a separate answer sheet

PART A
LICENSING CONDITIONS AND OPERATING PROCEDURES

1 The Licensee may only address messages

a to other licensed amateurs
b to other licensed amateurs who hold the same class of licence
c to other licensed amateurs and official stations (eg coastal stations and aeronautical stations)
d to other licensed amateurs having a common language.

2 In an amateur call sign the Regional Secondary Locator I refers to a station located in

a Jersey
b Guernsey
c Northern Ireland
d Isle of Man.

3 Which one of the following amateur bands is designated to meet the needs of international disaster communications?

a 1.81 MHz to 2.0 MHz.
b 14.0 MHz to 14.35 MHz.
c 28 MHz to 29.7 MHz.
d 430.0 MHz to 431.0 MHz.

4 Who may be permitted by the Licensee of an Amateur Radio Station to type the Message of the Licensee for transmission by the Licensee from the Station?

a Only the holder of an Amateur Radio Licence (A).
b Only the holder of an Amateur Radio Novice Licence (A).
c Only a club member.
d Any person.

5 When the Station is operated from a Temporary Location in the same country as that of the Main Station Address, the call sign given on the Validation Document of the Licence shall be used with

a no suffix
b the suffix /M
c the suffix /MM
d the suffix /P.

6 The Station may be used to send Messages on behalf of

a the User Service concerned
b any other licensed radio operator
c the Vessel's master when operating Maritime Mobile
d any person provided the Licensee bas no pecuniary interest in the message.

7 Which one of the following is NOT a requirement when operating on a Vessel?

a To observe radio silence on the advice of the Vessel's master.
b To have the written permission of tbe Secretary of State to install or use the Station.
c To have the written permission of the Vessel's master to install or use the Station.
d To have the written permission of the Vessel's master to make changes to the Station.

8 Entries in the Station Log need NOT include the

a date
b time of commencement of operation
c signature of Licensee
d time of closing down the Station.

9 The class of emission known as amplitude modulated telephony, single-sideband suppressed carrier (s.s.b.) is designated by the symbols

a H3E
b R3E
c A3E
d J3E.

10 The Amateur Radio Licence (A) states that to avoid causing interference the Licensee should conduct tests

a every 28 days
b every 30 minutes
c from time to time
d when instructed by authorised representatives of the Secretary of State.

11 An amateur radio station must be equipped for reception of

a telegraphy and telephony
b broadcasts of a general nature
c all frequency bands and classes of emission used in amateur radio
d the frequencies and classes of emission used for transmission of the Message by the station.

See next page

12 In the Amateur Radio Licence (A) the Standard Frequency Service means

a any operation using telephony
b a broadcasting service intended for general reception
c any operation in a band which has a Primary status in the Schedule to the Amateur Radio Licence (A)
d a radiocommunication service providing the transmission of specific frequencies for general reception.

13 Which one of the following is a requirement of the Amateur Radio Licence (A) with regard to the keeping of a log at the Main Station Address?

a Times should be given in BST or GMT whichever is in force.
b The call sign of the Station contacted should be entered for each contact.
c The reports sent and received should be noted.
d All entries should be made at the time of sending and receiving.

14 An Amateur Radio Licence should be available for inspection at any and all reasonable times hy a person acting under the authority of the

a County Emergency Planning Officer
b General Manager of the Local Telephone Area
c Secretary of State
d Chief Constable of the County concerned.

15 To which one of the following countries may greetings messages be sent by non-licensed persons if a licence is held on behalf of a club?

a Bermuda.
b Cyprus.
c Canary Islands.
d Falkland Islands.

16 Which one of the following may an Amateur Licensee record and retransmit?

a Music containing a wide range of audio frequencies.
b Messages addressed to the Licensee from other licensed amateurs.
c Messages on behalf of any social political, religious or commercial organisation.
d Messages between any licensed amateurs not intended for the reception of the Licensee.

17 A holder of an Amateur Radio Licence (A) or (B) may operate in the band 144-146 MHz at power levels not exceeding

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

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

a the band is only 50 kHz wide
b it is not permitted hy the ITU
c the Radiocommunications Agency forbids it
d propagation conditions are always poor.

19 It is good operating practice when calling by 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 Which one of the following is NOT acceptable for a Log?

a Magnetic tape.
b Disk.
c Book.
d Sheets of paper.

21 The main purpose of an amateur repeater station is to

a act as tuning aid
b increase the range of mobile stations
c improve data transmissions
d facilitate easier international contacts.

22 What is the Q-code for 'I am acknowledging receipt'?

a QSB.
b QRU.
c QSL.
d QSK.

23 Band plans are

a enforced by the IARU
b agreed voluntarily to ensure efficient use of amateur bands
c licence conditions imposed by the Radiocommunications Agency
d for use in amateur radio contests only.

24 The use of the phonetic alphabet in the amateur service is

a a requirement of the Radio Society of Great Britain
b only for use in international communications
c a means of ensuring accurate reception of difficult words or groups
d not permitted when using Morse telegraphy.

25 In the interest of safety in an amateur station an isolator switch should be installed just inside the door, which will disconnect all electrical equipment. Which one of the following is the MOST important property of such a switch?

a It should be painted red and illuminated.
b It should be illuminated with the word DANGER above it.
c The position and purpose must be known to all members of the household.
d It must be mounted high enough to be out of reach of children.

See next page

Part B

Principles and Practice

Answer questions 1 to 55 on a separate answer sheet

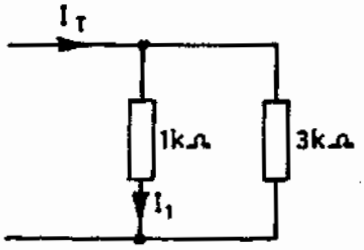


FIG. 2577

1 In Fig. 2577 the current I_T is 12 mA. What is the current in the 1 kΩ resistor?

a 3 mA.
b 4 mA.
c 6 mA
d 9 mA.

2 If a capacitor of 200 pF is connected in series with an inductor of 5 μH, the resonant frequency will be

a 14.2 MHz
b 12.8 MHz
c 7.5 MHz
d 5.0 MHz.

3 160 W is equivalent to

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

4 To forward bias a junction diode the positive supply should be connected to the

a 'p' junction in series with a suitable capacitor
b 'n' junction in series with a suitable resistor
c 'p' junction in series with a suitable resistor
d 'n' junction in series with a suitable capacitor.

5 A class C amplifier is unsuitable for amplification of a J3E single sideband signal because

a it operates with significant base current
b severe distortion of the input signal occurs
c a high level of drive power is called for
d this mode consumes least input power.

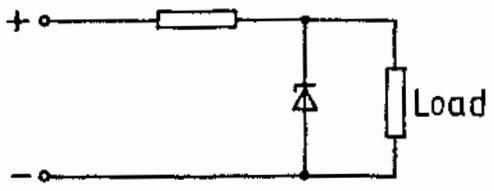


FIG. 1783

6 The circuit in Fig. 1783 shows

a a half-wave rectifier circuit
b a zener diode regulator
c an envelope detector
d a parallel tuned circuit.

7 In order to receive A1A Morse signals it is necessary to use a beat frequency oscillator (b.f.o.) because

a the variation of signal level requires stabilisation
b it cancels out any interferenee with other stations
c the signal is unmodulated and is not otherwise readable
d the noise level would otherwise be at an unacceptable level.

8 The characteristics of a frequency modulated signal are derived from the

a variations of amplitude and frequency of the modulating signal
b variation of amplitude only of the modulating signal
c variation of frequency only of the modulating signal
d carrier frequency and the frequency of the modulating signal.

9 To demodulate an s.s.b. signal the MOST important requirement is

a correctly set i.f. bandwidth
b correctly adjusted local oscillator
c a.g.c. switch 'ON'
d accurate tuning of the carrier insertion oscillator.

10 To which stage in a receiver is a.g.c. normally applied?

a Beat frequency oscillator.
b Carrier insertion oscillator.
c Intermediate frequency amplifier.
d Mixer.

See next page

11 In the first hour after switching on a transceiver, an acceptable drift would be

a 200 Hz
b 2 kHz
c 20 kHz
d 2 MHz.

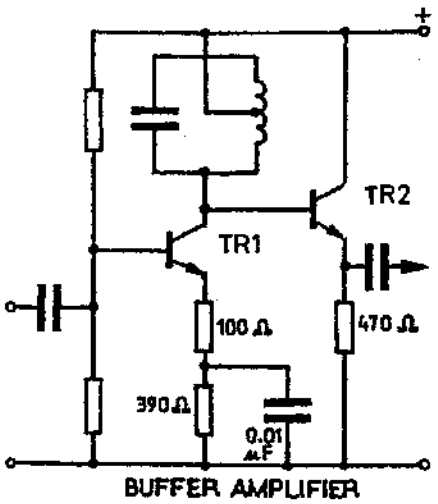


FIG. 1348

12 Transistor TR2 and its emitter resistor in Fig. 1348 are used to

a increase the voltage gain
b match the collector of TR1 to a lower impedance
c prevent the tuned circuit becoming unstable
d present a high impedance to the following stage.

13 The frequency response of a telephony transceiver should be limited to approximately 250-3000 Hz because this

a gives high fidelity reproduction
b reduces the bandwidth occupied by the signal
c meets ITU regulations
d meets IARU recommendations.

14 Split frequency operation

a enables the transmitter and receiver to operate on different frequencies
b permits a transmitter to operate on two wavebands simultaneously
c reduces the audio frequency response of the receiver
d eliminates interference from stations on adjacent frequencies.

15 The most serious effect of inadequate frequency stability in an amateur transceiver is that

a there will be over-deviation of the frequency modulated carrier
b the bandwidth will be excessive causing distortion on the audio signal
c there is a risk of out-of-band operation
d harmonics will be produced resulting in a heterodyne whistle.

16 Key clicks producing long range interference are caused by

a a steep rise and decay of carrier amplitude
b sparking at the key contacts
c keying the power amplifier
d shift of oscillator frequency when keying.

17 Too much audio applied to a frequency modulated transmitter should be avoided as it causes

a radiation of harmonics
b excessively wide sidebands
c overheating of the power amplifier
d production of parasitic oscillations.

18 Parasitic oscillations are caused by

a r.f. being induced in the mains supply to the transmitter and being fed back to domestic radio, television or audio equipment connected to the same supply
b self-oscillation of a stage of a transmitter due to the high total amplification between the oscillator and the power amplifier stage
c fluctuations of the power supply to the oscillator stage of a transmitter resulting in oscillation on two frequencies
d the inductance and capacitance of the wiring to the connections of the amplifier stage resulting in self-oscillation.

19 Which one of the following harmonics from a 2-metre amateur transmitter would fall in the TV band 471.25 MHz - 853.25 MHz?

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

20 The SUREST way of detecting the presence of parasitic oscillations is by

a tuning through the bands on a television receiver
b using a general coverage receiver
c tuning a receiver through the amateur band to which the transmitter is tuned
d tuning an f.m. receiver through the 80–100 MHz band.

21 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.

22 Key clicks which can be heard over a wide frequency band but only at relatively short distances are caused in a telegraphy transmitter by

a keying the oscillator stage
b sparking at the keying contacts
c the carrier rising almost instantaneously to peak amplitude when the keying contacts close
d the carrier falling almost instantaneously to zero when the keying contacts open.

23 Neutralisation of the p.a. stage of a transmitter is carried out to

a prevent self-oscillation
b increase r.f. output
c decrease r.f. output
d reduce r.f. leakage.

24 Which one of the following items of equipment will help reduce the level of harmonics from an h.f. transmitter?

a An s.w.r. meter.
b High pass filter.
c 50 Ω dummy load.
d Antenna tuning unit.

25 A synthesised transmitter uses an oscillator at 9.8 MHz. To prevent radiation of a signal at 9.8 MHz, the transmitter needs

a a high pass filter
b a low pass filter
c ferrite beads in the power amplifier
d good screening.

26 A v.h.f. transmitter works well with one microphone but is unstable with a different microphone. The instability can be stopped by

a increasing the microphone gain
b a high pass filter in the antenna lead
c r.f. bypass capacitors inside the microphone
d using different r.f. chokes in the p.a.

27 The 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.

28 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 frequency.

29 Which one of the following statements best describes the aims of e.m.c?

a To maximise the generation of transmitted r.f.
b To minimise the response to and the generation of unwanted r.f.
c To minimise the response to unwanted r.f.
d To minimise the generation of unwanted r.f.

30 Which one of the following items of equipment is least likely to be affected by an amateur radio transmission?

a Domestic telephone system.
b Electronic organ.
c Central heating thermostat
d Computer.

31 When transmitting on 433.000 MHz a neighbour complains of interference on a television receiver. What is the most likely cause of the interference?

a 3rd harmonic radiation.
b 5th harmonic radiation.
c Saturation of r.f. into the TV antenna.
d 2nd sub-harmonic radiation.

See next page

32 What steps can be taken to minimise e.m.c. problems generated within an amateur station by a computer?

a High pass filter fitted to transmitter and receiver.
b Ensure that transmitter and receiver are provided with an effective earth.
c Improve screening of receiver and transmitter.
d Improve computer screening and increase separation.

33 TV receiver blocking or desensitising is caused by

a lowering the antenna height
b maladjustment of the volume control
c adjusting squelch or mute control incorrectly
d strong r.f. signals on a nearby frequency to the one tuned.

34 A television receiver suffers interference in the form of a weak but identical image slightly to the right of the normal picture. This is due to reception of

a an amateur radio signal
b a foreign television transmitter
c a reflected television signal
d another channel from the transmitter sending the wanted picture.

35 A u.h.f. transmitter is found to cause interference to the VDU of a computer. A likely cure would be to

a fit a ferrite filter on the cable connecting the computer to the VDU
b fit a low-pass filter in the mains lead to the VDU
c reduce the brightness of the display
d operate the computer at an alternative clock speed.

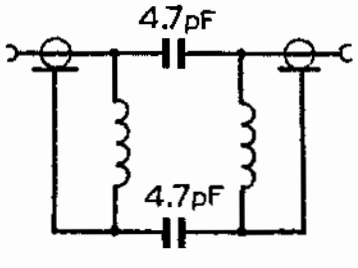


FIG. 2335

36 Fig. 2335 shows a

a TV braid breaker filter
b low-pass filter for a general coverage h.f. receiver
c wave trap for a v.h.f. receiver
d filter to suppress mains borne interference.

37 Mains borne interference can be minimised by

a adequate separation between a transmitter and its power supplies
b radio frequency filters installed at the point where mains leads enter a transmitter
c ensuring no d.c. connection between antenna and mains supply
d use of an isolating transformer between mains supply and transmitter.

38 When using a separate antenna tuning unit (a.t.u.), a suitable earth connection is

a the main supply earth
b coaxial cable braiding
c buried copper rods
d the transmitter earth terminal.

39 To reduce the level of mains borne 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.

40 A neighbour complains to an amateur that interference is being caused to television reception. What action should the amateur take?

a Ask the local office of the Radiocommunications Agency to investigate.
b Advise the complainant to ask the DTI RIS to investigate.
c Attempt a cure with the co-operation of the complainant.
d Ask the RSGB to liaise on behalf of the amateur.

41 A Yagi antenna, connected to a suitable receiver, is recommended for use in tracing sources of interference in the v.h.f. and u.h.f. bands because it

a is a perfect match to any type of feeder cable
b has an omnidirectional radiation pattern
c has directional characteristics
d has 0 dB front-to-back ratio.

42 When installing an amateur transceiver in a car, the d.c. power cable should be

a strapped to the vehicle's wiring loom
b routed away from the vehicle's wiring loom
c placed close to the engine management system
d wired using 300 Ω balanced feeder.

43 The distance from the transmitter at which a sky wave of a given frequency will be returned to earth by the ionosphere is called the

a critical path
b skip distance
c auroral reflection distance
d super-refractive path.

44 The lowest layer of the ionosphere is

a D
b E
c F_1
d F_2.

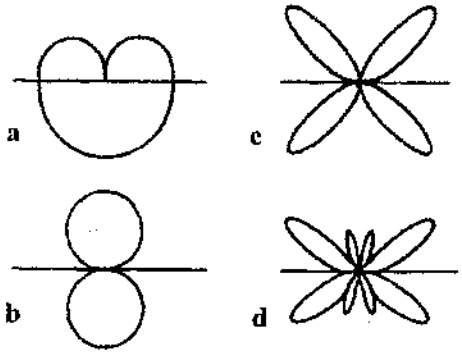
45 If a sky wave arrives at a receiver at the same time as a ground wave and they are appreciably out of phase, this may cause

a distortion of the modulation
b increased amplitude of the modulation
c fading of the received signal
d overloading of the r.f. stage.

46 A signal at 1 MHz in free space has a wavelength of

a 30 m
b 300 m
c 3 km
d 30 km.

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



48 The radiation resistance of a centre fed half wavelength folded dipole antenna at a height of two wavelengths is approximately

a 18.75 Ω
b 75 Ω
c 300 Ω
d 600 Ω.

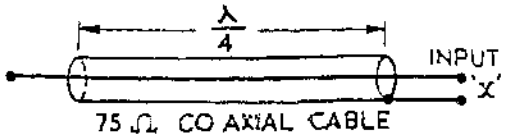


FIG. 0226

49 Refer to Fig. 0226. At a frequency of $\frac{300}{\lambda}$ MHz, the impedance of the line at x will be

a 75 Ω
b very high
c very low
d 37.5 Ω.

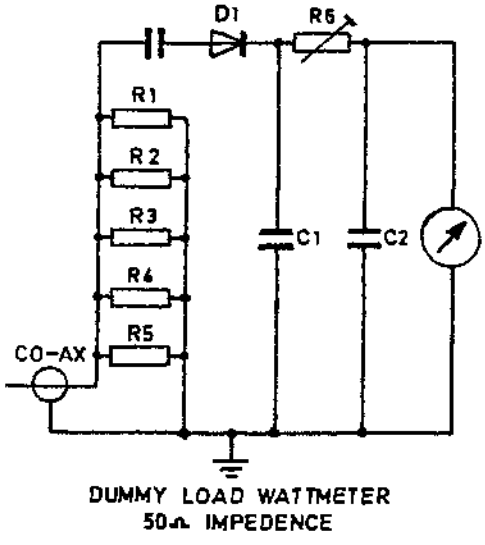


FIG. 0206

50 In Fig. 0206, the suitable type of instrument is a

a moving coil
b moving iron
c thermocouple
d hot wire.

51 A transmitter output power of 14 dBW is equivalent to

a 14 W
b 20 W
c 25 W
d 50 W.

52 A disadvantage of an absorption wavemeter is that it

a will not function below 28 MHz
b will not function above 28 MHz
c does not measure frequencies accurately
d only measures harmonics.

53 Suitable resistors for a dummy load are

a carbon
b incandescent lamps
c electrolytic
d wirewound.

See next page

54 A standing-wave ratio meter is used to

a count standing waves in a transmitter
b see if an antenna is radiating correctly
c check the matching of a transmission line to a transmitter
d check the radiation efficiency of an antenna.

55 The d.c. power input of a continuous wave transmitter may be measured by

a multiplying the applied voltage by the current to the collector of the device(s) energising the antenna
b using a power meter in series with the antenna
c applying a dummy load resistor to the transmitter and multiplying its value by the square of the current passing through it
d using an oscilloscope to measure the voltage across a dummy load resistor.

NOW GO BACK AND CHECK YOUR WORK BEFORE HANDING IN BOTH ANSWER SHEETS TO THE INVIGILATOR

- IMPORTANT —

Have you filled in your candidate number in PENCIL in the appropriate box on the answer sheets?

Have you filled in your answers in PENCIL in the appropriate boxes on the answer sheets?

