City & Guilds
Multiple choice question paper

Paper Number	Examination	
7650-010	**Radio Amateurs**	**Monday 14 May 2001**
Series	Paper	
May 2001	**Written**	**18 30 – 20 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

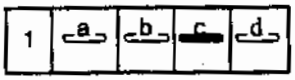
This question paper is the property of The City and Guilds of London Institute and is to be returned after the examination

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 Amateur Radio Licence (A) permits messages to be sent by the Licensee providing they

a cannot be deciphered by short wave listeners
b do not obscure the meaning of any communication
c do not refer to the licensing authorities
d do not form more than one quarter of any communication.

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

a P.
b CB.
c B.
d M.

3 The Amateur Radio Licence (A) excludes the use of the station to send messages by telephony

a for general reception by licensed amateurs
b comprising remarks of a personal character
c during operations conducted by the County Emergency Planning Officer
d by radio teletype.

4 When operating under the Amateur Radio Licence (A) a low power device to control apparatus at the Main Station Address by remote control, what is the maximum permitted carrier power?

a -20 dBW e.r.p.
b -7 dBW e.r.p.
c 7 dBW e.r.p.
d 20 dBW e.r.p.

5 Holders of an Amateur Radio Licence (B) may only operate on frequency bands below 30 MHz if they

a are RSGB members
b have passed the Novice Morse Test
c are in the presence of and supervised by the holder of an Amateur Radio Licence (A)
d do not use c.w. Morse telegraphy.

6 At a Temporary Location, the Licensee should use the following suffix with the call sign

a /P
b /M
c /MM
d TL

7 The Amateur Radio Licence (A) permits the Licensee to

a use the Station for business, advertisement or propaganda purposes
b send or receive news or messages on behalf of, or for the benefit or information of, any social, political, religious or commercial organisation
c use copyright material in messages transmitted by the Station
d record messages addressed to the Licensee by any licensed amateur with whom he is in direct communication.

8 An amateur station may NOT be established in a

a vessel on an inland waterway
b motorised caravan
c public transport vehicle
d private light aircraft.

9 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.

10 Operation of apparatus at the Main Station Address without the Licensee being present may take place when

a another licensed amateur operates on the Licensee's behalf
b the power output is kept below 3 watts
c on frequencies above 30 MHz
d it is operated by a low power device to control the station.

11 The time shown in the Log must be given in

a CET (Central European Time)
b BST (British Summer Time)
c EST (Eastern Standard Time)
d UTC (Coordinated Universal Time).

12 Which one of the following can be classified as J3E emission?

a One sideband with a reduced carrier.
b Two sidebands with a vestigial carrier.
c One sideband with a full carrier.
d One sideband with a suppressed carrier.

13 The class of emission F1D 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 nsing frequency shift keyed audio tone.

14 In order to meet the requirements of Amateur Radio Licence (A), the frequency measuring equipment necessary to verify that a 144 MHz crystal controlled transmitter is operating with emissions within the authorised band is a

a calibrated absorption wavemeter
b heterodyne wavemeter
c 1 MHz crystal oscillator used in conjunction with a receiver
d digital display frequency meter.

15 A private, ocean going yacht leaves its home base in Bristol (England), stops at Swansea (Wales) then crosses to Wexford (Eire) finally visiting Larne (Northern Ireland) before proceeding out of territorial waters into the Atlantic. If a call is now made which one of the following identifications is correct?

a G3ABC/MM.
b GW3ABC/MM.
c EI3ABC/MM.
d GI3ABC/MM.

16 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 with any wireless telegraphy
d interference to the local broadcast radio and television stations for the area.

17 Which one of the following frequency bands is allocated to the Amateur Service on a Primary basis?

a 144 - 146 MHz.
b 430 - 440 MHz.
c 1240 - 1260 MHz.
d 2310 - 2450 MHz.

18 In which one of the following frequency bands is 32 W (15 dBW) the maximum permitted Peak Envelope Power?

a 1.810 MHz - 1.830 MHz.
b 1.850 MHz - 2.000 MHz.
c 21.000 MHz - 21.450 MHz.
d 431.000 MHz - 432.000 MHz.

19 When correctly adjusted, which one of the following types of transmission occupies the least bandwidth?

a Amplitude modulated telephony.
b Continuous wave telegraphy.
c Slow scan television.
d Frequency modulated telephony.

20 The log of an amateur radio station

a must be kept securely away from any unauthorised person
b must only contain those details specifically called for in the licence
c can be a valuable aid to the operation of the station by logging all communications and observations in full
d must be retained at the station for at least one year.

21 One use of an amateur radio satellite is to

a enable a class B Licence holder to make international contacts
b receive weather pictures of the country
c store a CQ call for later re-transmission
d make a broadcast transmission to radio amateurs in general.

22 Which Q-code group would be used, on finding an unoccupied frequency, to ensure that it is not in use?

a QSB?
b QRU?
c QRL?
d QRS?

23 Effective use of the amateur radio frequency bands is best ensured by observance of the h.f. frequency band plan produced by the

a International Telecommunication Union
b Radio Society of Great Britain
c International Consultative Radio Committee
d International Amateur Radio Union.

See next page

24 The phonetic alphabet as set out in the Licence

a gives some protection from interception by third parties
b is compulsory
c must be confined to the words set out in the Licence
d should be used by the Licensee.

25 Which one of the following switches is most suitable for controlling the mains input to a power supply unit?

a Double pole, single throw.
b Double pole, double throw.
c Single pole, single throw.
d Single pole, double throw.

26 The peak-to-peak value of a sine wave having an r.m.s. value of 10 V is

a 7.07 V
b 14.14 V
c 20 V
d 28.28 V.

27 An inductor and capacitor in parallel are connected in series with the antenna lead to a receiver. The effect on the sensitivity of the receiver will be to

a decrease it at the resonant frequency of the combination
b increase it at the resonant frequency of the combination
c increase it at the frequencies below the resonant frequency
d increase it at the frequencies above the resonant frequency.

28 Which one of the following functions CANNOT be carried out by a power transformer?

a Change a given supply voltage to one of a higher value.
b Change a given supply voltage to one of a lower value.
c Supply a given current to a load circuit whose impedance differs greatly from that of the source of supply.
d Provide a higher power output from a low-power source of supply.

29 The depletion layer in a P-N junction is

a formed by chemical action
b an insulator for negative charges
c set-up by charge migration
d found only in germanium devices.

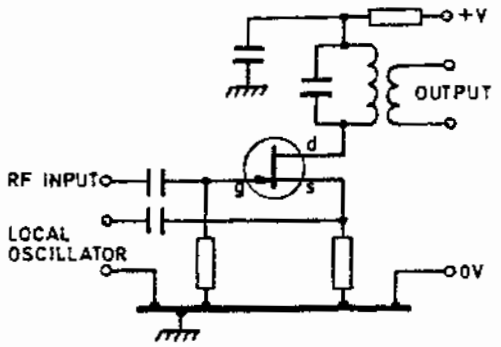


FIG. 1

30 Refer to Fig. 1. What is the circuit represented?

a A receiver mixer.
b An antenna pre-amplifier.
c An oscillator.
d A transistor switch.

31 What is the name of an active device used in power supplies to provide a regulated voltage?

a Light emitting diode.
b Fixed resistor.
c Variable resistor.
d Zener diode.

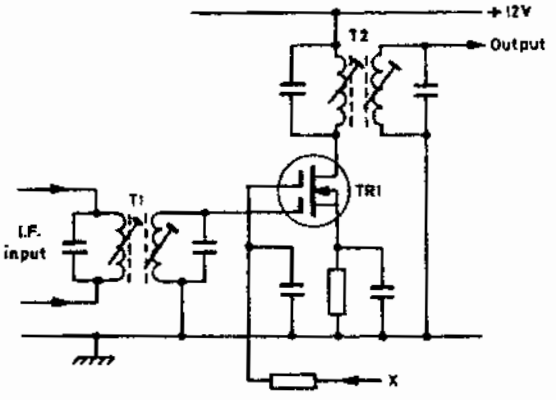


FIG. 2

32 Fig. 2 shows an intermediate frequency amplifier stage of a superheterodyne receiver. What affects the selectivity of the stage?

a Transistor TR1.
b The control voltage at point X.
c The turns ratio of transformer T1.
d The adjustment of transformers T1 and T2.

33 An amateur station operating on a frequency of 1940 kHz is causing interference to the reception of a 1000 kHz medium wave station on a transistor broadcast receiver. The interference is likely to be caused by

a harmonic radiation from the transmitter
b parasitic oscillations in the power amplifier stage of the transmitter
c poor image rejection in the receiver
d r.f. currents being induced in the public mains supply.

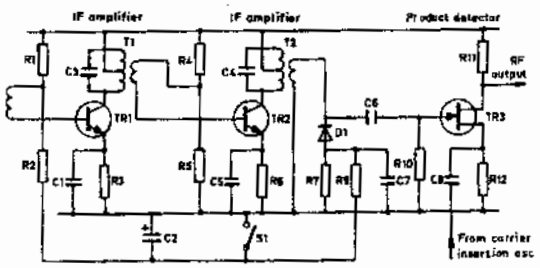


FIG. 3

34 A portion of a diagram of a superheterodyne receiver is shown in Fig. 3. What particular feature of the circuit indicates that the receiver would be able to demodulate an s.s.b. signal?

a TR3 is a JFET.
b Switch S1 enables or disables the agc.
c There is an input from a carrier insertion oscillator.
d D1 is reversed from the normal state.

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.

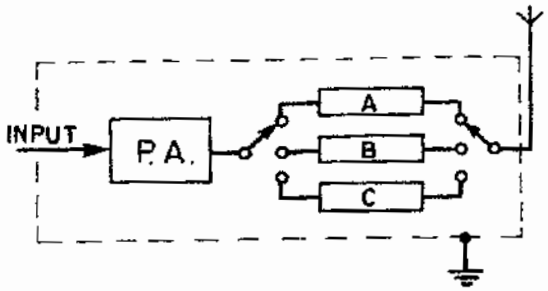


FIG. 4

36 Fig. 4 shows the transistor power amplifier stage of an h.f. transmitter, for use on 3.5, 7 and 14 MHz. The p.a. output circuit consists of broadband transformers, followed by three switched units A, B and C which are

a high pass filters
b low pass filters
c adjustable π networks
d antenna tuning units.

37 To function as an oscillator, a circuit must have

a a high stage gain
b a phase shift of 90° between input and output
c positive feedback between input and output
d negative feedback between input and output.

38 The deviation of an f.m. carrier depends upon the

a frequency of the modulating signal
b power output of the transmitter
c amplitude of the modulating signal
d pre-emphasis circuit.

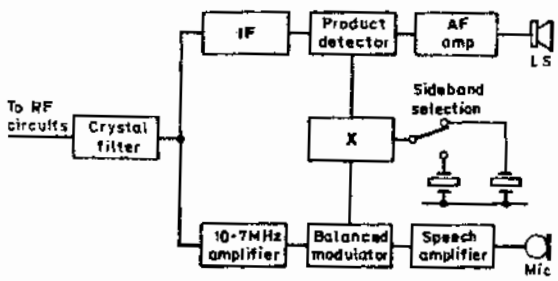


FIG. 5

39 Refer to the block diagram of part of an s.s.b. transceiver as shown in Fig. 5. When the transceiver is functioning as a receiver block X is a

a demodulator
b carrier insertion oscillator
c buffer amplifier
d notch filter.

See next page

40 Transmitter outputs at 2 or 3 times the wanted frequency are called

a harmonics
b key clicks
c splatter
d spurious oscillations.

41 A slow change in the pitch of speech heard on an s.s.b. transmission is caused by

a variation in the height of the E or F layers of the ionosphere
b reflections from aircraft
c magnetic storms in the troposphere
d oscillator drift in transmitter or receiver.

42 Class C operation should NOT be used for s.s.b. signals because the

a non-linearity causes distortion to the signal
b efficiency of a class C stage is low, typically about 30%
c efficiency of a class C stage is too high, typically about 80%
d high gain of a class C stage is likely to result in self-oscillation.

43 Increasing the deviation level of a frequency modulated transmitter will

a improve the speech quality
b increase the speech compression ratio
c overcome f.m. noise
d widen the r.f. bandwidth.

44 To ensure efficient use of the r.f. spectrum it is necessary to

a limit the audio bandwidth of the transmission
b use double sideband amplitude modulation
c use wide band frequency modulation
d use high speed data transmissions in the h.f. band.

45 It is desirable to use a buffer amplifier after an oscillator to

a boost the output level of the oscillator
b prevent spurious oscillations
c multiply the oscillator frequency
d isolate the oscillator from other stages.

46 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.

47 The r.f. bandwidth of a single sideband transmission containing audio frequencies between 250 Hz and 2500 Hz is

a 5000 Hz
b 2750 Hz
c 2500 Hz
d 2250 Hz.

48 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 readable.

49 Long range interference by key clicks from a c.w. transmission can be removed by

a improving the voltage stabilisation to the keyer stage
b using a manual rather than an electronic key
c modifying the keying circuit of the transmitter
d screening the lead to the key.

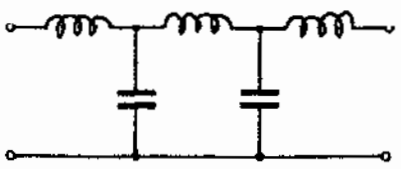


FIG. 6

50 The circuit in Fig. 6 would be suitable for

a attenuating high frequencies
b attenuating low frequencies
c blocking d.c.
d attenuating a band of frequencies.

51 An important reason for limiting the audio bandwidth of an amateur transmission is to minimise

a the risk of over-deviation
b the risk of over-modulation
c interference to television
d interference to stations operating on adjacent frequencies.

52 Which one of the following may be used to measure accurately the frequency of a transmitter that covers the whole of the 3.5 to 3.8 MHz band?

a S.W.R. meter.
b Digital frequency meter.
c Absorption-type frequency meter.
d Dip oscillator.

53 The frequency of an amateur transmitter can be checked most accurately by

a a sensitive transistor voltmeter
b an absorption wavemeter
c a calibrated receiver
d a 1 MHz crystal calibrator.

54 A Yagi antenna has a specified gain of 6 dB. What is the effective radiated power in the direction of maximum radiation when the input power to the antenna is 40 W?

a 40 W.
b 80 W.
c 160 W.
d 240 W.

55 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.

56 Which one of the following items will generate a broad band signal?

a Amateur transmitter.
b Scanning receiver.
c Mobile telephone.
d Commutator motor.

57 The abbreviation e.m.c. stands for

a electromagnetic compliance
b electromagnetic compatibility
c European magnetic compliance
d electromotive compatibility.

58 When an amateur station is operated on 14 MHz s.s.b., a nearby television receiver produces an audio output, the level of which is not affected by the volume control setting. The point of entry of the signal is likely to be at the

a sound i.f. amplifier
b sound demodulator
c mixer stage
d audio amplifier stage.

59 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.

See next page

60 A computer operated in an amateur radio station interferes with the station receiver. The simplest course of action is to

a loop the antenna lead through two ferrite rings as close to the antenna as possible
b move the computer as far from the radio receiver as possible
c use a fully screened clock crystal in the computer
d fit low pass filters at the mains supply entry point to the house.

61 Mains borne interference from an amateur station to sound or television broadcast reception is most likely to occur when

a the transmitter output contains a relatively high level of harmonics
b the receiver experiencing the interference has no earth connection
c r.f. energy from the transmitter antenna is coupled into the house wiring
d a long mains lead is used at the receiver and couples with the receiver wiring.

62 R.F. 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 What is the best arrangement for connecting an end-fed long wire antenna to a transmitter in order to minimise unwanted radiated signals from the downlead?

a A short downlead connected directly to the transmitter.
b A balanced feeder from the transmitter to the nearest end.
c A short downlead connected directly to an a.t.u. adjacent to the transmitter.
d The feed point sited well away from the house and fed with coaxial cable.

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

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

65 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.

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 A transmitter installed in a car should be located

a at least one metre from the battery
b as close to the wiring loom as possible
c away from any of the car's electronic units
d as close to the airbag as possible.

68 What are the two components of an electromagnetic wave?

a Space wave and ground wave.
b Voltage field and power field.
c Energy field and velocity field.
d Electric field and magnetic field.

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 The most common cause of fading in the h.f. bands is

a variation in transmitter output power
b attenuation of the ground wave
c signals arriving by different paths
d misalignment of a directional transmitting antenna.

71 Which one of the following is equivalent to 1.26 Gigahertz?

a 126000000 Hz.
b 12600000 kHz.
c 126 MHz.
d 1260 MHz.

72 Radials are normally used with a

a quad antenna
b trap dipole antenna
c vertical antenna
d Yagi antenna.

73 With low power amateur installations impedance matching is important because

a standing waves may damage the feeder
b it ensures the maximum transfer of power to the antenna
c standing waves destroy the relation between carrier and sideband frequencies
d it is a requirement of the Licence conditions.

74 The speed of radio waves through a cable divided by their speed in free space is known as the cable's

a characteristic impedance
b efficiency
c velocity factor
d dissipation.

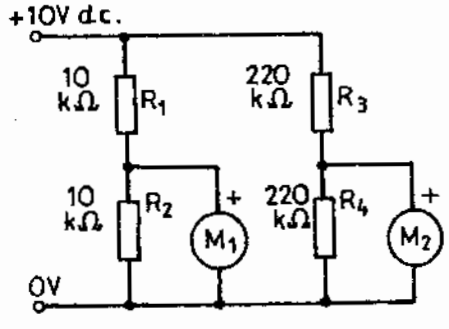


FIG. 7

75 Refer to Fig. 7. M_1 and M_2 are two meters having a sensitivity of 20,000 Ω/V. When both are used on the 10 V range, the reading on M_1 will be

a higher than that on M_2
b lower than that on M_2
c the same as that on M_2
d 10 V minus the reading on M_2.

76 The d.c. power input to the final amplifier is measured at a specific supply voltage by

a rectifying a proportion of the final signal
b measuring the current in the collector lead
c using a field strength meter
d means of a wattmeter having a constant impedance.

77 A power amplifier stage has an efficiency of 60%. When drawing 2 A from a 100 V supply, how much power will be dissipated from the amplifier as heat?

a 60 W.
b 80 W.
c 120 W.
d 200 W.

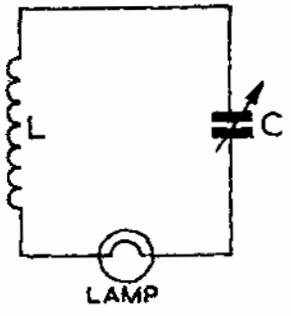


FIG. 8

78 Fig. 8 shows the circuit diagram of a device which may be used to

a measure the precise frequency of the transmitter
b detect the presence of overmodulation
c measure the approximate frequency of a transmitter
d measure the approximate frequency of a strong incoming signal.

See next page

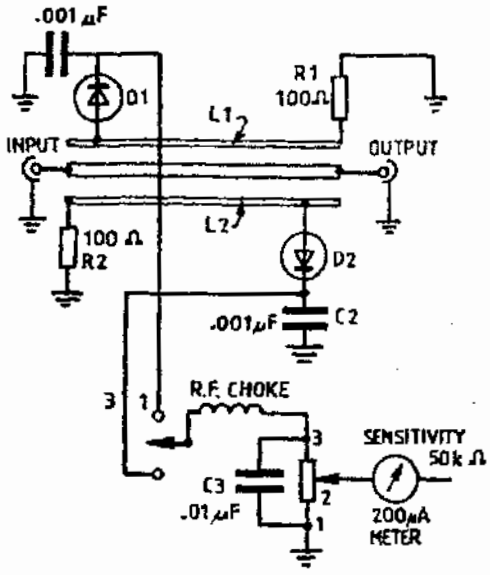
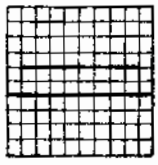


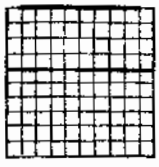
FIG. 9

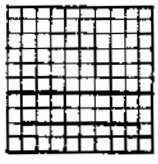
79 The instrument shown in Fig. 9 is designed to be connected between the

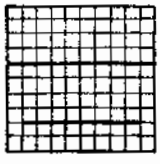
a transmitter and receiver
b transmitter and antenna
c microphone and transmitter
d mains and transmitter.

80 An oscilloscope has its time base switched on, and its gain set at 1 V per division. Which trace indicates −4 V d.c.?

a 

c 

b 

d 

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?