City & Guilds
Multiple choice question paper

Paper Number	Examination	Monday
7650-010	**Radio Amateurs**	**3 December 2001**
Series	Paper	**18 30 - 20 45**
December 2001	**Radio Amateurs' Examination**	**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

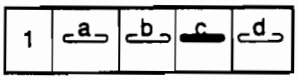
This question paper is the property of The City and Guilds of London Institute and is to be returned after the examination

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.

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

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

2 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.

3 Which one of the following statements is TRUE? An amateur is

a allowed to operate as a packet radio mailbox
b not permitted to record messages sent to them
c not permitted to re-transmit digital messages
d allowed to pass on messages from one amateur to another.

4 The period of validity of an amateur transmitting licence is

a six months
b one year
c five years
d ten years.

5 Which one of the following is NOT permitted to supervise the sending of greetings messages by non-licensed persons?

a Holder of the Amateur Radio Licence (A).
b Holder of the Amateur Radio Licence (B).
c The Chief Emergency Planning Officer.
d A properly Authorised Club Member.

6 Unattended operation for the purpose of direction finding competitions is permitted on

a 18.15 MHz
b 7.05 MHz
c 1.96 MHz
d 0. 137 MHz.

7 The class of emission symbol for Morse sent by hand using on off keying is

a A1A
b A1B
c A3E
d A3C.

8 Which one of the following is the designation for single sideband suppressed carrier?

a A3E.
b R3E.
c H3E.
d J3E.

9 A message on telephony may be sent for general reception by licensed amateurs provided that

a it is an initial call
b communication is not established with any station
c the information sent is of general interest
d the information is intended for disaster relief purposes.

10 Which one of the following frequency bands is allocated to the Amateur Service on a non-interference basis?

a 1.81 - 1.83 MHz.
b 7.0 - 7.10 MHz.
c 14.0 - 14.35 MHz.
d 21.0 - 21.45 MHz.

11 An amateur station MUST be capable of receiving messages in or on

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

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

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

13 An authorised person wishes to inspect the station log which is kept on computer disk. Which one of the following must be made available?

a Lap top computer with Windows 95 installed.
b Written copy of the contents of the disk.
c Means of displaying and printing the contents of the disk.
d Copy of the disk which can be taken away.

14 Which one of the following is the correct regional secondary locator for Northern Ireland?

a U.
b D.
c I.
d M.

15 Which one of the following is NOT an acceptable location identifier when operating at a Temporary Location?

a International Amateur Radio Union (IARU) locator.
b Latitude and longitude in degrees, and minutes.
c National Grid Reference correct to 10 km.
d The full postcode.

16 Which one of the following call signs shows that the station is located in the Isle of Man?

a GD0JMC.
b GE1MCR.
c GI0VLC.
d GM1XKY.

17 Amateur Radio Licence holders may operate in the band 431-432 MHz at power levels not exceeding

a 32 W (15 dBW)
b 40 W (16 dBW)
c 160 W (22 dBW)
d 400 W (26 dBW).

18 Which one of the following suffixes must be used by the licensee when the station is operated mobile?

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

19 Which one of the following amateur bands must be used when operating Maritime Mobile in international waters?

a Those listed in the licence schedule.
b Those of the nearest country.
c Those of the ITU region in which the ship is located.
d Those authorised by the ship's master.

DATE	TIME START BST	TIME END BST	BAND MHz	CLASS OF EMISSION	STATION CALLED WORKED HEARD	CALLING STATION
1-3-85	1417		144		COMMENCEMENT OF OPERATING	
	1420	1427	144	J3E	G 2ZZZ	G5XXX
		1430	144		STATION CLOSED DOWN	

FIG. 1

20 The Log shown in Fig. 1 is UNSUITABLE because

a time is shown in BST
b date is given in figures only
c the log entry is not signed
d the frequency band only is shown.

21 The main purpose of repeaters is to

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

22 At the end of a call in Morse to a station and before contact is established, which one of the following signals should be used?

a BT.
b K.
c AR.
d SK.

23 On which of the following bands is it recommended that s.s.b. should NOT be used?

a 10.100 - 10.150 MHz.
b 18.068 -18.168 MHz.
c 24.890 - 24.990 MHz.
d 50.00 - 52.00 MHz.

24 The recommended phonetic spelling for the word SQUELCH is

a Sierra Quebec Uniform Echo Lima Cuba How
b Sugar Queenie United Easy Love Cuba Havana
c Sierra Quebec Uniform Echo Lima Charlie Hotel
d Sugar Queenie Uncle Easy Love Charlie Hotel.

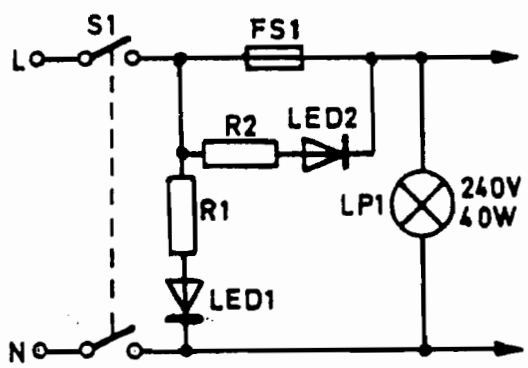


FIG. 2

25 A circuit has its mains input wired as shown in Fig. 2. If the fuse blows with S1 in the ON position

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

26 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.

27 A mains transformer delivers 22 V at 25 A from the secondary winding. The current in the 230 V primary winding will be approximately

a 5 A
b 4.2 A
c 3.5 A
d 2.4 A.

28 Decreasing the length of a self supporting inductor used in a tuned circuit so that the turns are closer together will

a lower the inductance of the coil
b lower the resonant frequency of the tuned circuit
c raise the resonant frequency of the tuned circuit
d reduce the dc resistance of the coil.

29 The gate, source and drain are connections to a

a field effect junction transistor
b germanium point contact transistor
c varactor diode
d p-n-p junction transistor.

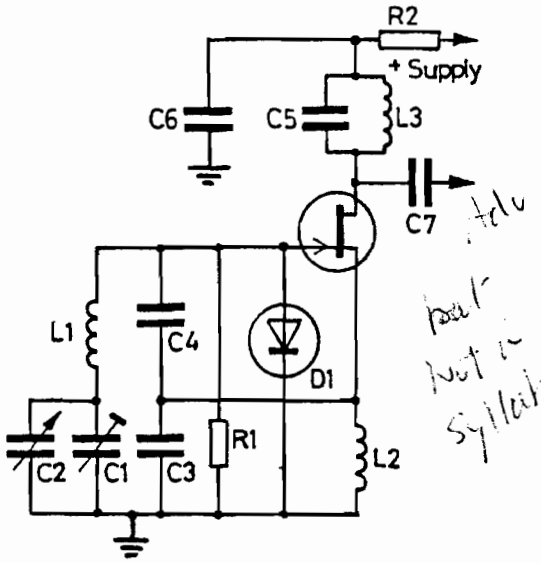


FIG. 3

30 Refer to Fig. 3. The frequency of operation of the circuit is mainly determined by the values of

a C1, C2, C3, L2
b C1, C2, C5, L1, L2
c C1, C2, C3, C4, L1
d C5, L1, L2, L3.

31 A reservoir capacitor in a power supply

a stores up energy during the positive half of the cycle
b stores up energy during the negative half of the cycle
c releases energy to the load during the positive half of the cycle
d increases the conductivity of the transformer.

32 A beat frequency oscillator is used in a receiver to

a detect frequency modulated signals
b make cw signals audible
c produce an intermediate frequency
d detect phase modulation.

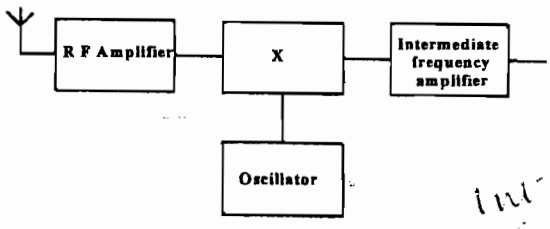


FIG. 4

33 Fig. 4 shows the block diagram of the front end of a superheterodyne receiver. The function of box X is to

a reduce the effect of co-channel interference
b prevent strong signals overloading the intermediate frequency amplifier
c convert the incoming signal frequency to the audio frequency
d change the incoming r.f. signal to the intermediate frequency.

34 The function of the detector or demodulator stage of a receiver is to

a produce a frequency control signal for the oscillator
b amplify the intermediate frequency signal
c recover the carrier from the modulation
d recover the modulation from the carrier.

35 In a superheterodyne receiver, the control voltage for a simple form of a.g.c. is obtained from a diode connected to the

a mixer stage
b audio output
c d.c. supply rail
d i.f. output.

36 If a frequency synthesised transmitter is operated before the phase-locked loop has achieved lock, this may result in

a out of band transmissions
b receiver damage
c excessive output power
d mains borne interference.

37 The local oscillator of a superhet receiver has an unwanted amplitude modulation. Which one of the following statements is correct?

a There will be an increased risk of receiving signals on the image frequency.
b The mixer will remove the unwanted modulation.
c The unwanted modulation will be added to the audio when correctly receiving f.m. signals.
d The unwanted modulation will be added to the audio when correctly receiving a.m. or s.s.b. signals.

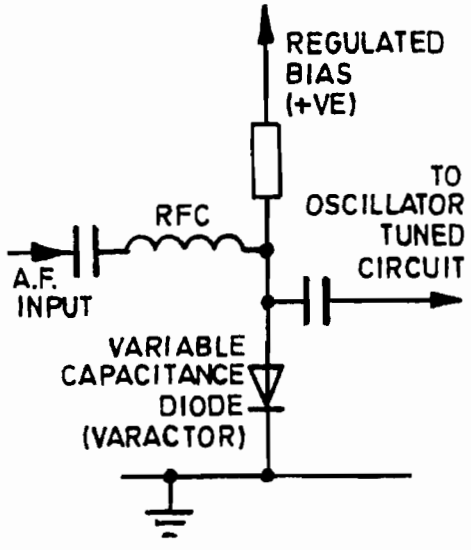


FIG. 5

38 The circuit shown in Fig. 5 would be used to

a apply frequency modulation to a transmitter
b ensure frequency stability of an amplitude modulated transmitter
c prevent over-modulation
d limit the range of modulating audio frequencies.

39 A dummy load should NOT be

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

40 The second harmonic of an amateur transmitter operating on 51.00 MHz falls in the

a u.h.f. aircraft band
b v.h.f. sound broadcasting band
c u.h.f. public utilities band
d 2 metre amateur band.

41 Increasing the deviation level of a frequency modulated transmitter will

a decrease the speech volume
b increase the speech compression ratio
c increase f.m. noise
d widen the r.f. bandwidth.

42 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.

43 Harmonic radiation from a transmitter using a thermionic valve in the power amplifier stage can be caused by

a using an unregulated power supply
b insufficient driving power
c excessive driving power
d too much voltage applied to the heater filament.

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

a harmonics
b key clicks
c splatter
d spurious oscillations.

45 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.

46 Poor frequency stability of an amateur transmitter may result in

a the generation of parasitic oscillations
b operation outside the amateur bands
c a reduction in the power output
d difficult adjustment of the power amplifier stage.

47 Which one of the following may BEST be used to check an amateur transmitter for spurious emissions?

a A dip oscillator.
b A VSWR meter.
c A general coverage receiver.
d A tunable antenna coupled to a low power light bulb.

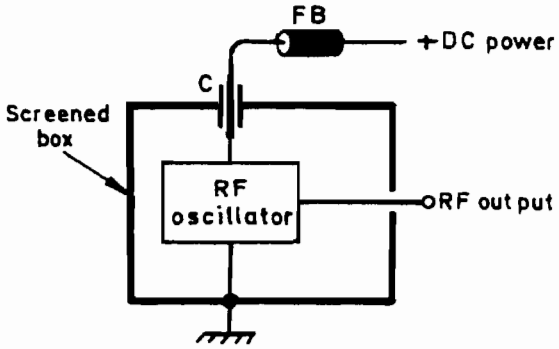


FIG. 6

48 Refer to Fig. 6. C is a feedthrough capacitor and FB is a ferrite bead. The C and FB combination will

a prevent r.f. oscillator currents travelling to the power supply and other stages
b provide a stabilised voltage for the oscillator
c provide a stabilised current for the oscillator
d shape the keyed signal elements when the transmitter is used for c.w.

49 Spurious emissions from the output stage of a single sideband transmitter can be caused by

a non-linearity of the output stage
b an unstabilised high tension supply
c an untuned collector circuit
d the transistor not having a heat sink.

50 If a transmitter is producing long range key clicks, these may be suppressed by

a screening the lead from the key to the transmitter
b inserting resistors
c connecting a resistor and capacitor in series across the key contacts
d connecting the key to the transmitter via a keying relay.

51 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.

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

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

53 Which one of the following harmonics from a 2 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.

54 An amateur receiver suffers continuous broadband interference during the hours of darkness. The interference is more severe on the 1.8 MHz band than higher frequency bands. Which one of the following is the most likely cause?

a An amateur transmitter with an unscreened carrier oscillator.
b A faulty thermostat controlling a central heating system.
c A faulty fluorescent lighting unit.
d A microwave oven.

55 An amateur transmitter is operating in its allocated frequency band and there are no harmonics or other spurious signals generated. Which one of the following is MOST likely to be affected if operated in close proximity?

a An electric toaster.
b A TV masthead signal preamplifier.
c A digital calculator.
d A thermostatic control valve on a central heating system.

56 Which one of the following devices found in an amateur radio station will cause interference over a wide range of frequencies?

a A signal generator.
b An audio oscillator.
c A radio transmitter.
d A computer.

57 The abbreviation e.m.c. stands for

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

58 A neighbour complains that operation of a h.f, s.s.b. transmitter is causing interference to an audio hi-fi unit. During investigation it is found that the interference occurs whichever audio input is selected on the hi-fi and is also unaffected by the setting of the volume control. Fitting a filter in the hi-fi mains lead has little effect. The next attempt to identify and cure the interference should be to fit

a a low pass filter to the transmitter output
b ferrite rings on the hi-fi speaker leads as close to the speakers as possible
c ferrite rings on the hi-fi speaker leads as close to the hi-fi as possible
d a 10 µF capacitor across the speaker terminals.

59 An amateur h.f. transmitter is causing interference to a neighbour's medium wave radio. Suitable filters have been fitted to the transmitter mains supply and the antenna feeder. The amateur is considering fitting a filter in the mains lead to the neighbour's radio. Is this likely to be helpful in combating the interference?

a No, because the filter on the mains of the transmitter has taken care of the possibility of conducted interference.
b No, because a reduction in transmit power is the only remaining possibility.
c Yes, because the mains filter should have been fitted to the neighbour's receiver, not the transmitter.
d Yes, because it is realistic that r.f. energy will be present on the neighbour's mains, despite the filter on the transmitter.

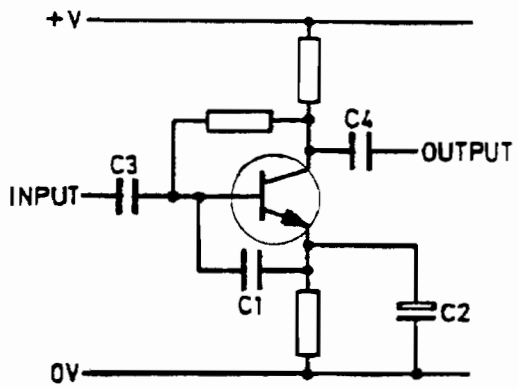


FIG. 7

60 The circuit in Fig. 7 is an audio amplifier. Which capacitor has the function of improving immunity to interference from a transmitter?

a C4.
b C3.
c C2.
d C1.

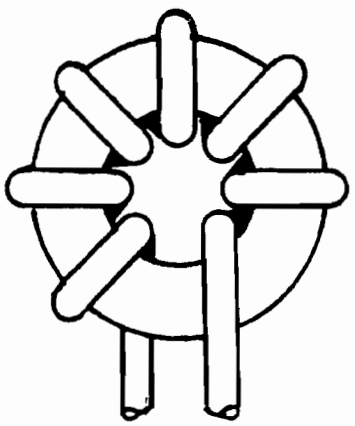


FIG. 8

61 Fig. 8 shows a toroidal core on which cable has been wound to make a mains choke for filtering. Which one of the following materials would be correct for the core?

a Copper.
b Ferrite.
c Nylon.
d Ceramic.

62 How should a transmitting antenna be positioned relative to a TV aerial?

a Mounted on the same pole.
b As far away as possible.
c At a distance of 20 metres.
d With its elements at right angles.

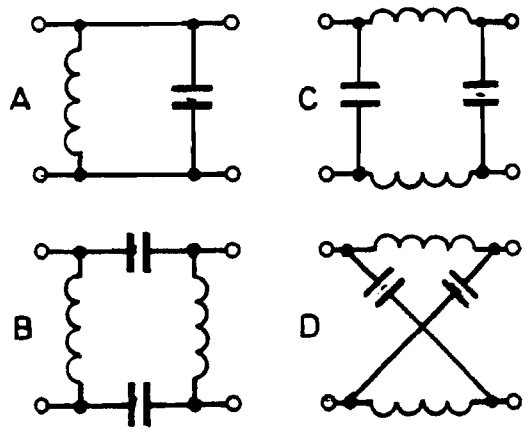


FIG. 9

63 Refer to Fig. 9. Which one of the four types of filter shown should be fitted in the mains cable of a transceiver to minimise the amount of r.f. energy fed into the mains supply?

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

64 An earthed strip of copper foil, wide enough to cover the whole of the primary windings, is placed between the primary and secondary windings of a mains transformer. The reason for this is to

a make sure that the mains voltage cannot accidentally be connected to the secondaries
b help reduce mains borne interference
c set up an e.m.f. to oppose eddy current losses
d reduce the self-capacitance of the secondaries.

65 Where complaints of interference from an amateur station are found to be justified, the licensee's first step is to

a provide a list of remedies
b provide a list of television dealers
c discuss remedies with the neighbour
d fit a braid breaker to the neighbour's television receiver.

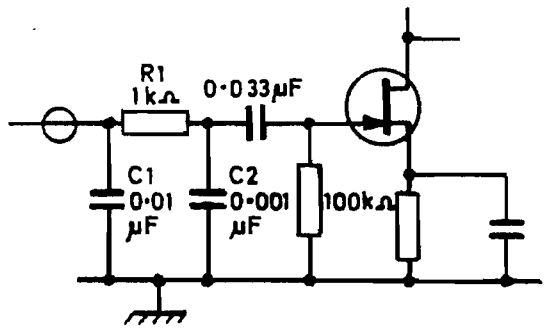


FIG. 10

66 The main purpose of the components R_1, C_1, and C_2, in the microphone amplifier shown in Fig. 10, is to

a reduce the level of mains hum
b filter out any r.f. feedback
c limit the bandwidth of the a.f. signals
d match the microphone to the gate circuit.

67 The operation of a transceiver in a modern car could cause

a dangerous disruption to the vehicle's electronic systems
b the vehicle battery to be charged too rapidly by the alternator
c no problems because of E.E.C. regulations covering e.m.c. in vehicles
d compatibility problems only when operating on low power.

68 A radio wave has electric and magnetic fields which travel

a in phase but at 90° to the direction of travel
b out of phase but at 90° to the direction of travel
c in phase and in the direction of travel
d out of phase but in the direction of travel.

69 Propagation of radio waves at v.h.f. and u.h.f. is determined mainly by

a the ionosphere
b tropospheric conditions
c air temperature
d the time of day.

70 Fading of a radio signal is caused by

a refraction of the direct wave
b a combination of ground wave and sky wave
c reception in the skip zone
d waves travelling by slightly different paths.

71 Which amateur band includes a frequency of 3725 kHz?

a 80 metres.
b 40 metres.
c 15 metres.
d 10 metres.

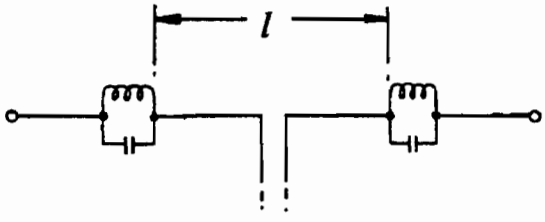


FIG. 11

72 Fig. 11 shows a multiband antenna designed for the 14 and 28 MHz bands. The length ***l*** will be approximately

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

73 Coaxial cable feeder should be connected to a dipole antenna via a balun because

a both coaxial cable and a dipole antenna are electrically balanced
b both coaxial cable and a dipole antenna are electrically unbalanced
c coaxial cable is electrically unbalanced and a dipole is balanced
d coaxial cable is electrically balanced and a dipole is unbalanced.

74 A transmission line is another name for

a a π network
b a transmitter output circuit
c an r.f. filter
d a feeder.

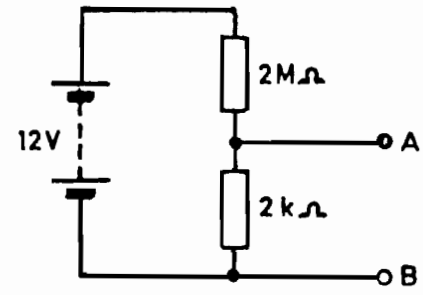


FIG. 12

75 One suitable instrument to measure the voltage across AB in Fig. 12 would be

a a micro-ammeter
b a moving iron voltmeter
c an electrostatic voltmeter
d a digital multimeter.

76 100 W of r.f. power is expressed as

a 5 dBW
b 10 dBW
c 20 dBW
d 26 dBW.

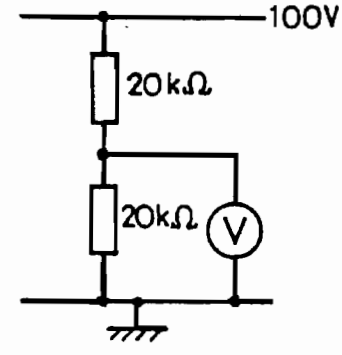


FIG. 13

77 Refer to Fig. 13. If the meter resistance is 20 kΩ, the voltmeter reading will be approximately

a 33 V
b 50 V
c 66 V
d 75 V.

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

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

79 Suitable resistors for a dummy load are

a carbon
b incandescent lamps
c electrolytic
d wirewound.

80 Which one of the following controls on an oscilloscope must be adjusted to make the trace stationary?

a X-Gain.
b Time base.
c Trigger level.
d Focus.

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?