City & Guilds
Multiple choice question paper

Paper number	Examination	Monday
7650-010	**Radio Amateurs**	**6 December 1999**
Series	Paper	**18 30 - 20 45**
December 1999	**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.

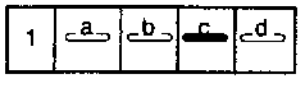
You may refer to the attached schedule to help in answering any of the questions.

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.
- Print your name in the box provided on 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 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 Licensee of an Amateur Radio Station may use the station for communicating with other licensed amateurs

a in any aircraft or other airborne vehicle
b by broadcasting to licensed amateurs in general
c as part of the self-training of the Licensee in communication by wireless telegraphy
d with messages in any language cypher or code provided they are of a personal nature to the Licensee.

2 What are the necessary qualifications for obtaining an Amateur Radio Licence (A)?

a A pass in the Radio Amateurs Examination at any time.
b A pass in the Radio Amateurs Examination within the last year.
c A pass in the Radio Amateurs Examination and a pass in the Amateur Morse Test within the last year.
d A pass in the Radio Amateurs Examination and a pass in the Amateur Morse Test at any time.

3 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 which ever is in force.
b The call sign of the station contacted should be written down 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.

4 When mobile, the Licensee MUST use the following suffix with the call sign

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

5 An F3E class of emission can be defined as frequency modulated

a telegraphy, by frequency shift keying
b telegraphy, by on/off keying
c telephony
d television, high definition.

6 The Regional Secondary Locator D refers to

a Scotland
b Wales
c Isle of Man
d England.

7 Where the Log is maintained on a disk

a the disk shall be used only to keep the Log
b a hand written 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.

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

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

9 The Station may be used to send messages on behalf of

a the User Services concerned
b any other licensed radio operator
c the vessel's Master when operating Maritime Mobile
d any person provided the Licensee has no pecuniary interest in the message.

10 Which one of the following call signs indicates a club station located in England?

a GC7XJN.
b GX0ZXY.
c 2C0VMZ.
d 2E1XUL.

11 One way that Amateur Radio Licences (A) and (B) can be revoked is by a

a verbal request from the police
b written request from the planning authority
c general broadcast by the British Broadcasting Corporation
d telephone message from the M.O.D.

12 When using Morse telegraphy, key clicks should be suppressed to such a level that

a they are completely eliminated
b they do not exceed beyond 10 kHz of the carrier frequency
c its use does not cause any undue interference to any wireless telegraphy
d they are undetectable by nearby stations.

13 The holder of an Amateur Radio Licence (A) or (B) may transmit

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

14 A CEPT Class 2 licence corresponds to the UK Amateur Radio Licence

a Class A
b Class B
c Class A Novice
d Class B Novice.

15 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 using frequency shift keyed audio tone.

16 An amateur whose call sign is G2XYZ should, when transmitting from a temporary location in the Isle of Man, use the call sign

a G2XYZ/P
b GD2XYZ/T
c GD2XYZ/P
d GM2XYZ/P.

17 In which one of the following wavebands is there a segment with maximum power level of 20 dBW?

a 80 metres.
b 30 metres.
c 6 metres.
d 2 metres.

18 Holders 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.

19 Which of the following amateur bands may 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 2 Z Z Z	G5 X X X
		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 is not signed
d the frequency band only is shown.

21 Repeaters are mainly

a for contacting overseas countries
b for extending the range of mobile stations
c to stop fading
d to indicate radio conditions.

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

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

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.

24 The spelling of the word TCHAD using the recommended phonetic alphabet is

a Tare Charlie How Able Dog
b Tango Cork How Alpha Delta
c Tempo Cork Hotel Able Delta
d Tango Charlie Hotel Alpha Delta.

25 During a thunderstorm it is advisable to

a disconnect the antennas and unplug the radio and computing equipment
b inform other amateurs via the local repeater of the storm
c switch from the mains supply to a standby battery supply
d change to a higher frequency band to avoid the interference caused by the lightning.

See next page

26 The impedance at resonance of a series tuned circuit containing inductance and capacitance is

a maximum
b minimum
c capacitive
d inductive.

27 The resonant frequency of a tuned circuit is given by the expression

a $f = \frac{1}{\pi\sqrt{LC}}$

b $f = \frac{1}{2\pi\sqrt{LC}}$

c $f = 2\pi\sqrt{LC}$

d $f = 2\pi\sqrt{LC \times T}$.

28 What is the output voltage when a transformer with a 3 to 1 turns ratio is connected to a 240 V mains supply?

a 60 V.
b 80 V.
c 240 V.
d 2160 V.

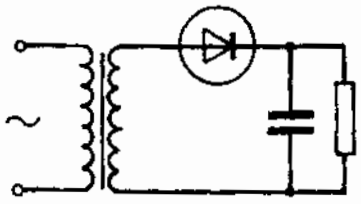


FIG. 2

29 In Fig. 2 the diode rectifier circuit is of the type known as

a half wave
b bi-phase
c bridge
d quarter wave.

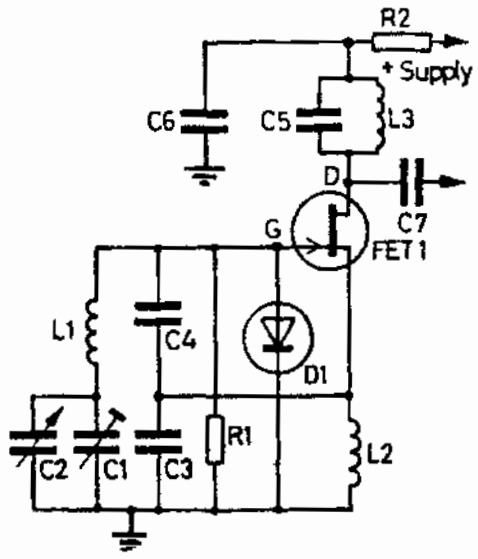


FIG. 3

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

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

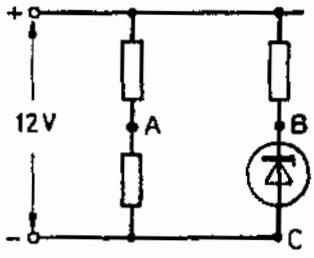


FIG. 4

31 Refer to Fig. 4. The voltage between A and B is zero when the voltage between B and C is 6 V. If the supply voltage rises from 12 V to 14 V the voltage between A and B will

a not alter
b become 1 V, with A positive to B
c become 1 V, with B positive to A
d become 2 V, with A positive to B.

32 What are mixed in the mixer stage of a superheterodyne receiver?

a The incoming signal and the output from the carrier insertion oscillator.
b The intermediate frequency and the output from the carrier insertion oscillator.
c The intermediate frequency and the output from the local oscillator.
d The incoming signal and the output from the local oscillator.

33 A broadcast receiver having an intermediate frequency of 470 kHz receives a strong telephony signal on 908 kHz from a nearby amateur station transmitting on a frequency of 1848 kHz. The transmitter is known to be free of measurable spurious emissions. This is an example of

a an image frequency response by the receiver
b the result of high harmonic content in the local oscillators
c the result of using A3E rather than J3E
d breakthrough in poorly designed intermediate frequency receiver.

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

a correctly set i.f. bandwidth
b correctly adjusted r.f. amplifier
c a.g.c. switch 'ON'
d correct setting of the carrier insertion oscillator.

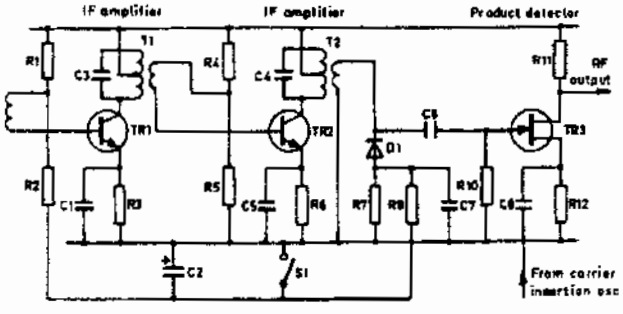


FIG. 5

35 Fig. 5 is a simplified diagram showing part of the circuit of a superheterodyne receiver. The function of D1 is to

a demodulate the signal
b provide damping on T2 to adjust the bandwidth
c rectify the i.f. to provide a.g.c.
d prevent r.f. current flowing through R7.

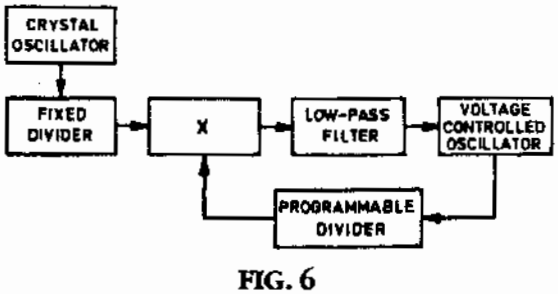


FIG. 6

36 Fig. 6 is the block diagram of a frequency synthesiser. Block X is the

a mixer
b frequency doubler
c frequency tripler
d phase detector.

37 In r.f. power amplifiers, which class of bias offers the HIGHEST efficiency and WORST linearity?

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

38 The MOST suitable audio bandwidth for radio telephony transmissions by an amateur transmitter is

a 3 Hz to 340 Hz
b 34 Hz to 3000 Hz
c 300 Hz to 3400 Hz
d 340 Hz to 34 000 Hz.

39 In an s.s.b. transmitter, the unwanted sideband is removed in the

a carrier oscillator
b crystal oscillator
c crystal filter
d balanced modulator.

40 Which one of the following transceiver controls MUST be adjusted to reduce interference from a station on an adjacent channel?

a AF gain.
b RF power.
c Squelch.
d Notch.

41 The effect of the attenuator on an h.f. transceiver is to reduce the

a receiver sensitivity
b transmitter ourput
c receiver audio frequency response
d transmitter bandwidth.

42 To which one of the following is an a.c. source connected in a power amplifier valve?

a Anode.
b Cathode.
c Control grid.
d Screen grid.

43 Modulation of a carrier by frequencies in the range 400 to 15 000 Hz would

a provide high power output from the transmitter
b produce sidebands liable to cause interference
c cause distortion of the radiated signal
d cause harmonics in the transmitter r.f. output.

See next page

44 Why is it desirable to limit the peak amplitude of the audio signal applied to a f.m. modulator?

a To prevent unwanted amplitude modulation.
b To provide pre-emphasis.
c To prevent excessive deviation.
d To prevent harmonic radiation.

45 A transmitter is connected to a dummy load during 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.

46 Which one of the following harmonics from a 2 metre amateur transmitter falls in the TV band 471.21 MHz - 853.25 MHz?

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

47 A synthesiser includes a variable frequency oscillator and a crystal oscillator. The purpose of the crystal oscillator is to

a provide frequency stability
b keep the output level constant
c ensure smooth variation of the output frequency
d trigger activate the variable oscillator.

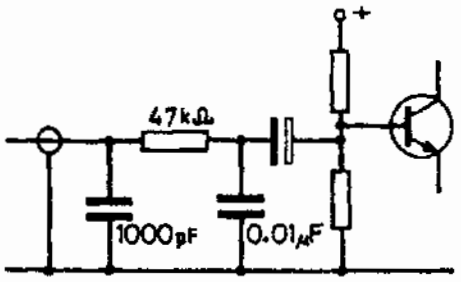


FIG. 7

48 The circuit shown in Fig. 7 is used

a as a precaution against overmodulation
b to limit the modulating frequency range
c to match a crystal microphone to the amplifier input circuit
d to increase the high frequency response of the modulator.

49 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 at 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.

50 A convenient means of measuring the frequency of a received signal is to use a

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

51 The frequency of an amateur transmitter can he checked MOST accurately by

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

52 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.
h A TV masthead signal preamplifier.
c A digital calculator.
d A thermostatic control valve on a central heating system.

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

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

54 Which one of the following devices causes narrow-band interference? A

a thermostat
b thyristor
c radio transmitter
d station digital meter.

55 An amateur transmission may be unnecessarily broad if the

a high frequency content of the voice produces excessive sidebands
b low pass filter is incorrectly coupled to the antenna
c r.f. driving power to the power amplifier stage is inadequate
d antenna circuit to the power amplifier stage is incorrectly loaded.

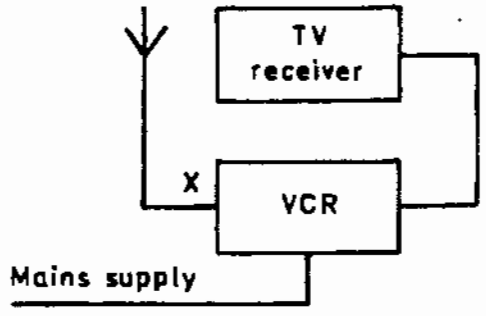


FIG. 8

56 The TV receiver shown in Fig. 8 experiences severe patterning and loss of picture by a nearby amateur transmitter operating on the 28 MHz band. Which device connected at point X is MOST likely to cure the problem?

a A 2 μF a.
b A 30 dB attenuator.
c A high-pass filter.
d A low-pass filter.

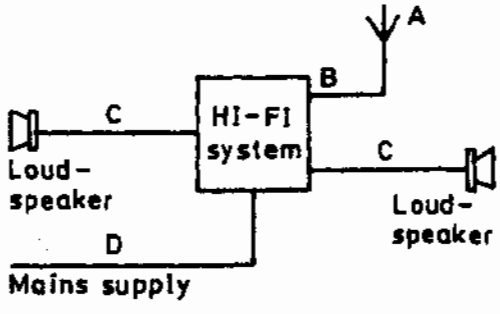


FIG. 9

57 Fig. 9 shows a hi-fi system which is suffering audio breakthrough from a nearby amateur transmitter. The system has long rolled-up loudspeaker leads, and a 4.5 dB gain antenna 10 metres above ground, fed by low loss coaxial cable. The level of breakthrough does not decrease when the volume control is reduced. What is the first step in the process of eliminating the breakthrough?

a Change the antenna A to one with a higher gain.
b Fit an intermediate frequency trap at B.
c Shorten the loudspeaker leads C.
d Insert a low-pass filter in the mains supply lead at D.

58 A braid breaker filter in the downlead to a TV receiver stops h.f. transmissions breaking through by

a blocking r.f. current on the braid
b providing the h.f. signals with a low impedance path to earth
c acting as a low-pass filter
d improving the matching between the TV antenna and the TV set.

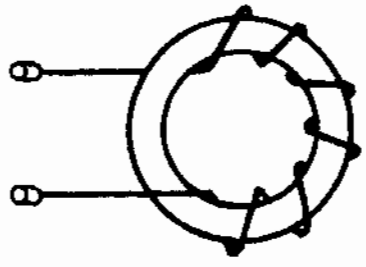


FIG. 10

59 Refer to Fig. 10. The device shown is

a a ferrite ring choke
b a v.h.f. balun transformer
c an image channel rejector
d a Faraday screen.

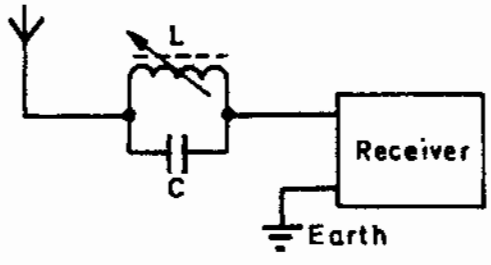


FIG. 11

60 Refer to Fig. 11. An i.f. trap consisting of L and C has been fitted in the antenna circuit of a receiver to block an unwanted signal at, or near, the intermediate frequency. This is

a an accepter circuit
b a rejector circuit
c an absorption circuit
d a circulating circuit.

61 Which one of the following is likely to cause the GREATEST interference problems?

a A loft mounted h.f. trap dipole.
b A v.h.f. collinear antenna mounted on an aluminium mast 25 metres from any dwelling.
c A u.h.f. Yagi antenna mounted on an aluminium mast 25 metres from any dwelling.
d A 70 MHz ground plane antenna mounted on a chimney stack.

See next page

62 It is good practice to keep a transmitting antenna away from mains wiring in order to minimise

a harmonic radiation
b audio instability
c mains borne interference
d 50 Hz hum on the transmission.

63 A 50 Hz a.c. mains filter MUST be capable of

a passing all frequencies above 50 Hz
b attenuating frequencies of 50 Hz and above
c passing all frequencies and modes of transmission in use at the station
d matching the mains supply to the transmitter to obtain maximum power transfer.

64 Given the following coaxial feeder specifications, which one should be selected for use as a feeder for both receiving and transmitting antennas?

a High loss. 30 dB per 10 metres.
b High loss. 12 dB per 10 metres.
c Low loss. 7 dB per 10 metres.
d Low loss. 1 dB per 10 metres.

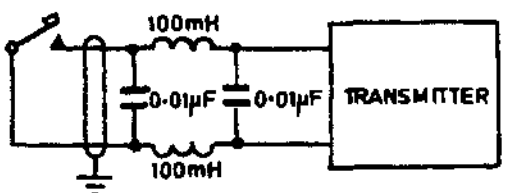


FIG. 12

65 The filter circuit shown in Fig. 12 is suitable for eliminating

a key clicks causing short range interference
b key clicks causing long range interference
c chirp
d frequency shift.

66 A neighbour has complained and logged the interference from an amateur transmitter. What should be the first action taken by the amateur to establish the likely cause?

a Compare the amateur log with that of the complainant for any likely correlation.
b Ask the RIS to investigate.
c Reduce transmitter power on all amateur bands.
d Fit filters to neighbour's equipment.

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

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

68 The field strength of an electromagnetic wave is usually measured in

a microamps/m^2
b microvolts/m
c milliwatts/m^2
d microamps/m.

69 HF signals above the Maximum Usable Frequency (MUF)

a pass through the ionosphere into space
b are absorbed in the E layer
c cause ionisation of the F layer
d are reflected back to earth by the D layer.

70 If the period of a radio wave is 0.01 microseconds, the free space wavelength of the wave will be

a 3 cm
b 3 m
c 3 km
d 30×10^6 km.

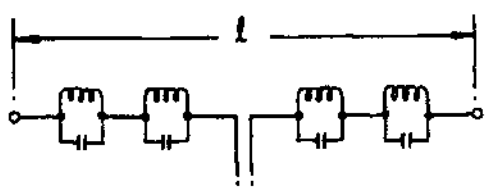


FIG. 13

71 Fig. 13 shows a multiband antenna designed for 7, 14, 21 and 28 MHz bands. The overall length (l) of the antenna will be

a 40 metres
b somewhat less than 20 metres
c somewhat less than 10 metres
d 5 metres.

72 The critical frequency is the

a lowest frequency which will be reflected by the ionosphere
b highest frequency which is reflected by the troposphere
c optimum frequency for transmitting over a long distance
d highest frequency which will be returned by the ionosphere at vertical incidence.

73 A half-wave folded dipole aerial is connected by a 300 Ω feeder to a receiver having an input impedance of 75 Ω. The matching transformer will have a turns ratio of approximately

a one to one
b two to one
c four to one
d six to one.

74 The characteristic impedance of coaxial cable normally used in Amateur Radio is

a 3 Ω
b 15 Ω
c 50 Ω
d 300 Ω.

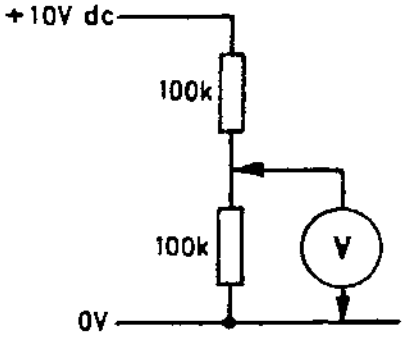


FIG. 14

75 An analogue meter switched to the 10 V d.c. range indicates 3.3 V when connected as shown in Fig. 14. The sensitivity of the meter is

a 5000 Ω/V
b 10 000 Ω/V
c 50 000 Ω/V
d 100 000 Ω/V.

76 The power of 10 W is equivalent to

a 5 dBW
b 10 dBW
c 50 dBW
d 100 dBW.

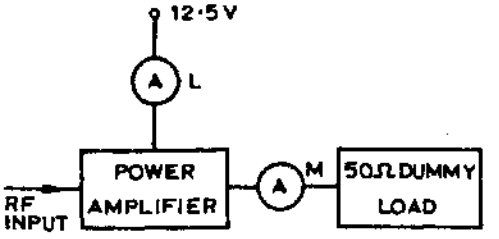


FIG. 15

77 Fig. 15 shows a power amplifier connected to a dummy load. Meter L reads 8 A. Meter M reads 1 A. What is the efficiency of the p.a.?

a 25%.
b 50%.
c 75%.
d 100%.

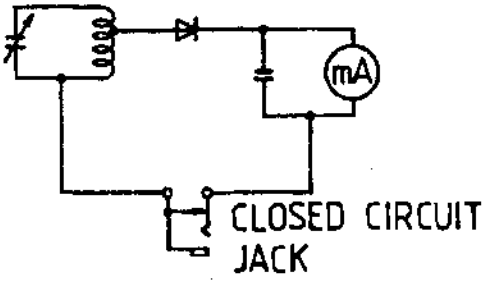


FIG. 16

78 What is the circuit in Fig. 16 used for?

a Monitoring the modulation level of a f.m. signal.
b Measuring accurately the frequency of a transmitted signal.
c Measuring accurately the frequency of a received signal.
d Checking that frequency multiplying stages are tuned to the correct harmonic.

79 Which one of the following combinations of resistors would be the BEST for constructing a 75 Ω dummy load for use up to 10 W at 1.8 MHz?

a Ten ¼ W, 750 Ω carbon resistors.
b Six 2 W, 450 Ω carbon resistors.
c Two 5 W, 150 Ω wirewound resistors.
d One 10 W, 75 Ω wirewound resistor.

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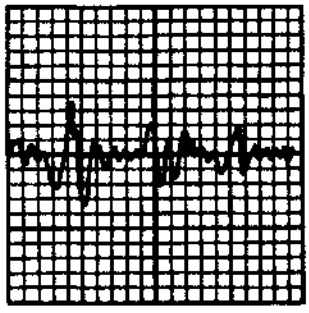

FIG. 17

80 Refer to Fig. 17. This represents an oscilloscope trace of an audio signal. Which one of the following adjustments MUST be made to make the amplitude greater?

a Decrease VOLTS/CM.
b Increase VOLTS/CM.
c Decrease SECS/CM.
d Increase SECS/CM.

NOW GO BACK AND CHECK YOUR WORK

● IMPORTANT —

Have you printed your name in INK in the appropriate box on the answer sheet?

Have you filled in your answers in INK in the appropriate boxes on the answer sheet?

