

# CITY AND GUILDS OF LONDON INSTITUTE

PAPER NUMBER <b>7 6 5 – 1 – 0 1/0 2</b>	EXAMINATION <b>RADIO AMATEURS</b>	<b>Thursday 18 May 1978</b>
SERIES <b>MAY–JUNE 1978</b>	PAPER <b>WRITTEN</b>	<b>18 30 – 21 30 3 hours</b>
YOU SHOULD HAVE THE FOLLOWING FOR THIS EXAMINATION  <b>one answer book 'Castle's Logs'</b>		

This examination is divided into two parts; failure in either part will carry with it failure in the examination as a whole.

Each question in Part I carries 15 marks; each question in Part II carries 10 marks. Answer EIGHT of the following ten questions as follows: BOTH questions in Part I and SIX questions from Part II.

**PART I – Answer BOTH questions in this part. Each question in this part carries 15 marks.**

- 1 The Amateur Licence A is subject to six specific limitations of use covering
  - (a) situations in which the station may not be established
  - (b) frequencies and classes of emissions to be used
  - (c) operators and their qualifications
  - (d) broadcast messages in the amateur service
  - (e) use of radioteleprinter
  - (f) language and content of messages.State these SIX limitations.
  
- 2
  - (a) At what percentage modulation should a double-sideband (A3) amplitude-modulated radiotelephony transmitter be operated for satisfactory communications?
  - (b) What is the effect on the radiated signal if a modulation depth greater than 100% is used?
  - (c) Describe a method of monitoring an amplitude-modulated signal in order to ensure that the desired depth of modulation is not exceeded.

**PART II – Answer ANY SIX questions from this part. Each question in this part carries 10 marks.**

- 3
  - (a) Describe how an electromagnetic wave in the frequency band 3 to 30 MHz can be refracted and reflected by the ionospheric layers.
  - (b) What is meant by the term 'maximum usable frequency' (m.u.f.) with reference to long distance radiocommunication between two points on the earth's surface?
  
- 4
  - (a)
    - (i) What is meant by a linear amplifier?
    - (ii) Why is this type of amplifier necessary for high power amplification in a single-sideband transmitter.
  - (b) What is the advantage of Class AB1 operation of a linear amplifier device over Class A or Class B?
  
- 5
  - (a) Describe with the aid of a sketch, a dipole aerial using wave-traps (tuned rejector circuits) to enable it to be used on two or more harmonically-related frequency bands.
  - (b) Describe the action of the wave-traps.

- 6 Fig. 1 shows the i.f. and detector stages of a receiver. With the aid of this diagram
- explain the purpose of automatic gain control (a.g.c.)
  - state the method of obtaining a.g.c. and describe the action of the a.g.c. system in the given circuit.

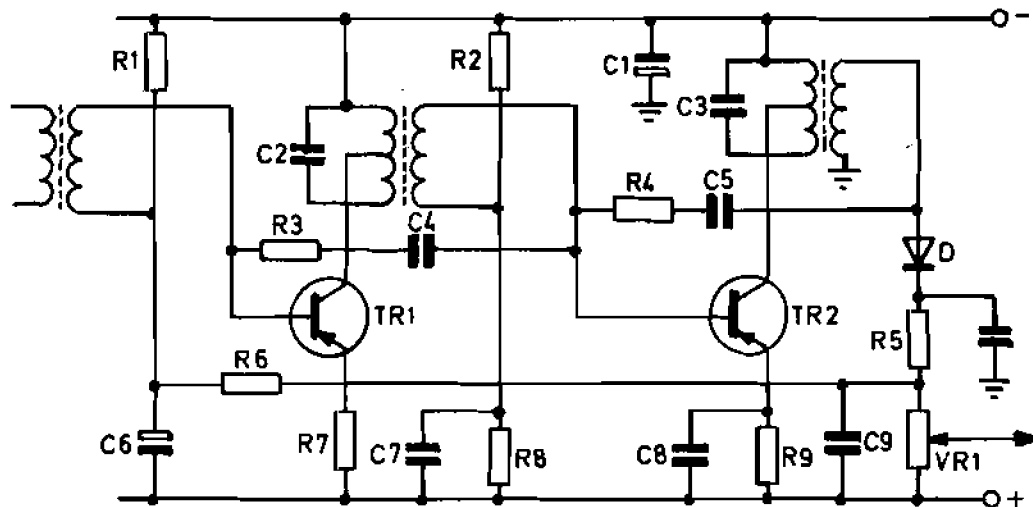


FIG. 1

- 7
- State a typical use for EACH of the following types of capacitor
    - silvered mica
    - paper dielectric
    - electrolytic.
  - Which one of these three types requires a d.c. polarizing potential and why is this necessary?
  - What is the total capacitance of three capacitors of 1 microfarad, 2 microfarad and 3 microfarad which are connected
    - in series
    - in parallel.
- 8
- What is meant by an alternating current of sine waveform?
    - State ONE method by which such a current may be generated.
  - An alternating emf has a peak value of 340 volts and a frequency of 50 Hz. Sketch a curve showing one cycle of this voltage and indicate the time after commencement of the cycle when maximum and minimum voltage values occur.
  - What is the r.m.s. value of the voltage?
- 9 With the aid of block diagrams explain the differences between the demodulation of double-sideband (A3) and single-sideband suppressed carrier (A3J) signals.
- 10 Answer EITHER
- With the aid of a circuit diagram explain the operation of a heterodyne frequency meter incorporating a crystal oscillator.
- OR
- Sketch the front panel of a modern frequency meter of a type suitable for measuring accurately the frequency of an amateur radio transmitter. Name ALL the controls and explain carefully how the instrument is used.
    - State on what factors the accuracy of the frequency meter depends.