CITY AND GUILDS OF LONDON INSTITUTE

PAPER NUMBER	EXAMINATION	
765—1—01/02	RADIO AMATEURS'	Thursday 20 May 1976
SERIES MAY—JUNE 1976	PAPER WRITTEN	6.30 to 9.30 pm 3 hours
YOU SHOULD HAVE THE FOLLOWING FOR THIS EXAMINATION one answer book 'Castle's Logs'		

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. (a) List the types of messages and signals which the holder of an Amateur (Sound) Licence is authorised to receive.
   (b) What are the requirements on a Licensee who receives a message the receipt of which is not authorised by his licence?
   (c) On what frequencies, or bands of frequencies, should an Amateur (Sound) station be equipped for reception?

2. Fig. 1 shows the circuit of a low power amplifier stage for a morse telegraphy transmitter.

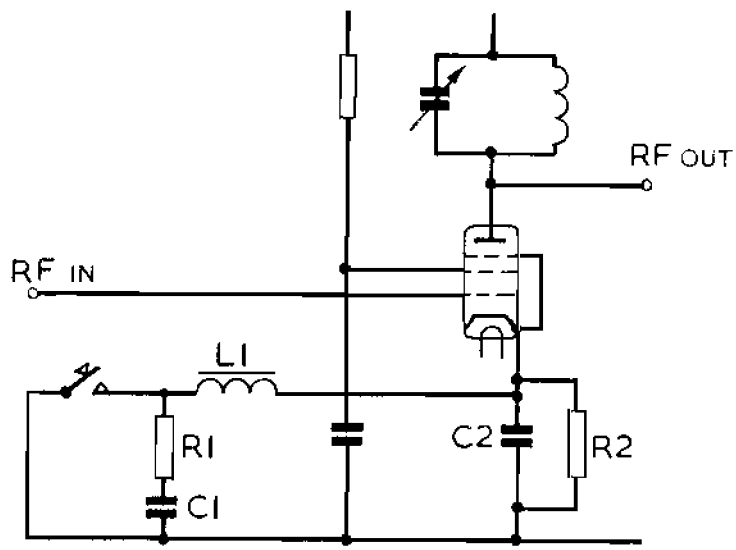

FIG. 1

   (a) State the function of
      (i) L1, R1 and C1
      (ii) R2 and C2.
   (b) What are the disadvantages of keying the oscillator stage of a transmitter?

See next page

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

3. (a) Describe, with the aid of diagrams, the operation of
EITHER
(i) a thermionic vacuum diode,
OR
(ii) a semi-conductor rectifier.
(b) (i) Draw the circuit diagram of a fullwave rectifier power unit capable of providing a smoothed output of 25 volts at 2 amps, from a 240 volt 50 Hz a.c. mains supply.
(ii) Describe the full-wave rectification action of the diodes.

4. (a) What factors decide
(i) the ratio of output voltage to input voltage in a power transformer
(ii) the maximum secondary current that may be permitted to flow?
(b) A power transformer has a primary winding of 1600 turns and a secondary winding of 200 turns. If the primary is connected to a source of a.c. at 240 volts 50 Hz, what voltage will appear across the secondary winding? (Assume losses to be negligible.)
(c) Describe a typical low frequency power transformer and state why a laminated soft iron core is used.

5. (a) State the formula for Ohm's Law and identify the units used.
(b) Three resistors of 100 ohms, 150 ohms, and 300 ohms respectively are connected in parallel. What is the total resistance and what current flows if an e.m.f. of 15 volts is applied to the combination?

6. (a) Describe, with the aid of diagrams, the construction of
(i) a balanced feeder line
(ii) an unbalanced feeder line.
(b) What is meant by the characteristic impedance of a feeder and what factors determine its value?

7. (a) What equipment is necessary for accurate (within the terms of the Amateur (Sound) Licence) measurement of the frequency at which a transmitter is operating?
(b) Explain, with the aid of diagrams, the heterodyne method of making frequency measurements.

8. (a) With reference to a superheterodyne receiver, what is meant by
(i) second channel or image frequency interference
(ii) adjacent channel interference?
(b) Why must these be taken into account when considering choice of intermediate frequency?
(c) How does a double superheterodyne receiver assist in overcoming the types of interference mentioned in part (a) of this question?

9. (a) Draw the circuit diagram of a variable frequency oscillator suitable for use in an h.f. transmitter.
(b) Explain how oscillations are set up and maintained.

10. (a) What is meant by the wavelength of an electromagnetic wave?
(b) How are wavelength and frequency related to the velocity of a radio wave?
(c) What is the wavelength of electromagnetic waves in free space at frequencies of
(i) 3510 kHz
(ii) 144·125 MHz?