City and Guilds
of London Institute

May–June Series 1969 ©

Examination **Radio Amateurs'**
Examination

Date **Wednesday 21 May 1969**

Time **6.30 p.m. to 9.30 p.m.** (*3 hours*)

You should have the following for this examination
 one answer book
 mathematical tables (you may use a slide rule).

The maximum mark for each question is shown.

This paper contains ten questions: answer **eight** questions as follows: both questions in Part I (which are compulsory) and **six** questions in Part II. Failure in either part will carry with it failure in the examination as a whole.

Part I—Answer **both** questions in this part

1. What are the conditions of the Amateur (Sound) Licence as regards the purposes for which the station may be used?

    State three types of message or communication which may not be sent from an amateur sound station.

    (15 marks)

2. Describe what is meant by over-modulation of an amplitude modulated radiotelephony transmission. Why must this condition be avoided?

    Describe a method or device for indicating when a transmission is being over modulated.

    (15 marks)

Part II—Answer six questions in this part

3. What is the superheterodyne principle of radio reception?

    With the aid of a circuit diagram describe the action of the frequency changer stage of a superheterodyne receiver.

    (10 marks)

4. What is meant by the r.m.s. value of an alternating current of sine waveform?

    Sketch a sine wave of 282·8 V peak, 50 Hz. What is (a) the period in seconds of one cycle, (b) the r.m.s. value of the voltage?

    An e.m.f. of 200 V r.m.s. 50 Hz is connected to an inductor whose resistance is 10 Ω and inductive reactance at 50 Hz is 30 Ω. What are the r.m.s. and peak values of the current which would flow?

    (10 marks)

5. Describe a simple experiment to show the existence of a magnetic field around a wire carrying an electric current.

    What is the effect on the magnetic field if the wire is wound into a coil on a soft iron core?

    State a rule for determining the polarity of the electro-magnet so formed.

    (10 marks)

6. Describe with the aid of a circuit diagram how a transistor can be used as an amplifying device at audio frequencies.

    (10 marks)

7. Draw the circuit diagram of a c.w. transmitter consisting of oscillator, buffer/frequency multiplier and power amplifier stages with pi-network output and capable of operating in the 3·5, 7 and 14 MHz bands.

    Explain how the pi-network is adjusted to obtain maximum r.f. output for a given d.c. power input to the power amplifier stage.

    (10 marks)

8. Describe how two radio stations can communicate with each other by long-distance ionospheric propagation.

    Why is it usually necessary to change frequency according to the time of day?

9. Describe a form of multi-band aerial system capable of radiating with reasonable efficiency.

What precautions should be taken to suppress harmonic radiation?

(10 marks)

10. Explain how a moving-coil instrument can be adapted to measure current at

   (a) audio frequencies

   (b) radio frequencies.

(10 marks)