*Paper Number*
**055 - 1 - 01 / 02**

# City and Guilds of London Institute

May–June Series 1970 ©

*Examination* **Radio Amateurs' Examination**

*Date* **Monday 11 May 1970**

*Time* **6.30 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 limitations imposed by the Amateur (Sound) Licence on the use of the station as regards the following

(*a*) use on waterways or moving vehicles
(*b*) classes of emission to be used
(*c*) persons who may operate the station
(*d*) sending of messages to other amateur stations
(*e*) transmissions by radioteleprinter
(*f*) content of messages?

Which Act of Parliament empowers the Minister of Posts and Telecommunications (formerly Postmaster General) to grant licences?

(15 marks)

**See next page**

2. Define

(*a*) *harmonic radiation*

(*b*) *parasitic oscillations.*

State the precautions which can be taken to prevent a radio frequency power amplifier stage from producing parasitic oscillations. Describe the action of the device or devices used.

(15 marks)

**Part II**—Answer **six** questions in this part

3. What is meant by *capacitance?*

Describe how a store of energy builds up in a capacitor when it is connected to a source of d.c. through a resistor.

How much energy is stored in a capacitor of 10 μF when it is connected to a 500 volt d.c. supply?

What safety precautions are necessary when handling high voltage capacitors?

(10 marks)

4. What is meant by

(*a*) *resistance*

(*b*) *reactance*

(*c*) *impedance?*

State the formulae for calculating the reactance and impedance of a series a.c. circuit containing inductance, capacitance and resistance.

What is the dynamic resistance of a parallel resonant circuit consisting of an inductor of 100 μH inductance and 1 ohm resistance and a capacitor of 500 pF?

(10 marks)

5. With the aid of a circuit diagram describe the construction of a variable frequency oscillator suitable for use in an h.f. transmitter.

Describe how oscillations are set up and maintained.

(10 marks)

6. Why is a beat frequency oscillator necessary for the audio reception of continuous wave telegraphy?

Describe a typical b.f.o. and show how this stage is coupled to the receiver circuitry.

(10 marks)

7. With the aid of circuit diagrams describe a system of amplitude modulation and explain its action.

How can the depth of modulation be controlled as a protection against overmodulation?

(10 marks)

8. Describe what is meant by

(*a*) fadeouts due to ionospheric disturbance

(*b*) fading.

What are the effects of each on the reception of electromagnetic waves at a distance?

(10 marks)

9. Describe a form of directional aerial suitable for use on any one of the amateur bands.

Sketch the polar diagrams in the vertical and horizontal planes.

(10 marks)

10. Draw the circuit diagram of a crystal controlled heterodyne frequency meter and explain how it may be used to measure the frequency of emission of an h.f. transmitter.

(10 marks)