55/1 (May)

City and Guilds of London Institute

May–June Series, 1967

Radio Amateurs' Examination

Friday, May 12th, 1967, 6.30 to 9.30 p.m.

This paper contains ten questions: EIGHT questions in all are to be attempted, 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.

You should have the following for this examination:

One answer book, which includes squared paper (inches and tenths).

Mathematical tables (you may use a slide rule).

PART I

Answer BOTH *questions in this part*

1. What are the conditions of the Amateur (Sound) Licence A as regards:
   (*a*) frequency control and measurement,
   (*b*) receivers,
   (*c*) non-interference with any other wireless telegraphy?
   (15 *marks*)

2. What is meant by:
   (*a*) adjacent channel interference,
   (*b*) image frequency interference,
   (*c*) intermediate frequency breakthrough?
   Explain how filters and wavetraps can be used to protect receivers against interference from transmitters operating on other frequencies.
   (15 *marks*)

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PART II

Answer SIX *questions in this part*

3. What is meant by electro-magnetic induction?
Describe two methods of demonstrating this phenomenon.
(10 *marks*)

4. Describe with the aid of a block diagram a superheterodyne receiver and explain the superheterodyne principle of reception.
(10 *marks*)

5. Describe the part played by the ionosphere in the propagation of radio frequency waves in the band 3 Mc/s (MHz) to 30 Mc/s (MHz).
(10 *marks*)

6. Define the units of e.m.f., current and resistance and state Ohm's Law.
A battery, whose open circuit e.m.f. is 6 V, passes a current of 1·2 A when connected to a 4 Ω resistor. What is its internal resistance?
(10 *marks*)

7. What is meant by *resonance* in a series resonant circuit? Why is such a circuit sometimes called an accepter circuit?
What is meant by the magnification or Q of a circuit?
A vertical aerial has a natural inductance of 10 μH and a natural capacitance of 60 pF. What is its resonant frequency when it is connected to earth through a coil of 50 μH?
(10 *marks*)

8. What is meant by *amplitude modulation?*
Explain the meaning of the terms *modulation envelope, depth of modulation, sidebands.*
Sketch a graph illustrating a carrier frequency of 200 kc/s (kHz) having an amplitude of 2 V modulated by a sinusoidal frequency of 10 kc/s (kHz) having an amplitude of 1·5 V. What is the depth of modulation in this instance? (10 *marks*)

9. What is meant by standing waves in an aerial feeder? In what circumstances are they present and how can they be detected?
(10 *marks*)

10. Describe, with the aid of a circuit diagram, a P.A. stage suitable for use in an amateur sound transmitter and which provides a reduction in radiated harmonics.
Explain carefully the method of tuning and adjusting the stage.
(10 *marks*)