55/1 (May)

City and Guilds of London Institute

1964-5

Radio Amateurs' Examination

Friday, May 7th, 1965, 6.30 to 9.30 p.m.

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

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. The Amateur (Sound) Licence authorises a licensee to establish a station at a main address, at temporary premises or locations or at alternative premises.

   What are the conditions under which these various locations may be used as regards

   (*a*) period of use and notification (if any) to the Post Office,

   (*b*) variations of call-signs?

   What conditions are imposed by the Amateur (Sound) Licence as regards inspection of an amateur station?

   (15 *marks*)

2. Describe carefully the precautions taken to obtain frequency stability in a variable frequency oscillator suitable for use in an amateur radio transmitter.

   (15 *marks*)

[See next page

PART II

Answer SIX *questions in this part*

3. What is meant by the *intermediate frequency* of a superheterodyne receiver? Draw the circuit diagram and explain the action of the detector and AVC stage of a superheterodyne receiver.

(10 *marks*)

4. With the aid of a circuit diagram describe a power supply unit suitable for providing a stabilised 150-volt h.t. supply for the oscillator stage of a transmitter from 240-volt 50-c/s mains. Explain how stabilisation is achieved.

(10 *marks*)

5. Describe the construction of a type of fixed capacitor found in modern radio equipment. Give two examples of the use to which the capacitor you have described could be put and indicate typical values. Three capacitors of 50, 50 and 100 picofarads respectively are connected (*a*) in series and (*b*) in parallel with each other.

What is the total capacitance in each case?

(10 *marks*)

6. What is the velocity of electro-magnetic waves? State the relationship between wavelength, frequency and velocity. What is meant by a quarter-wave vertical aerial? With the aid of a diagram show the current and voltage distribution in such an aerial.

(10 *marks*)

7. Draw the circuit diagram of a simple radiotelephony transmitter for the 1·8 Mc/s amateur band. State the function of each stage.

(10 *marks*)

8. What is meant by impedance, reactance and resonance in an a.c. circuit? What is the natural frequency of a tuned circuit having 20 picofarad capacitance and 100 microhenry inductance. (Assume resistance to be negligible.)

(10 *marks*)

9. Describe the construction and explain the action of *either* a voltmeter *or* an ammeter. What is the principal difference between a voltmeter and an ammeter? Explain, with sketches, how an ammeter and a voltmeter would be connected into a circuit consisting of a battery, a switch and a lamp so as to show the voltage applied to, and the current flowing through, the lamp.

(10 *marks*)

10. With the aid of a block diagram explain how you would set up a heterodyne frequency meter to measure the frequency of an amateur radio transmitter. Describe carefully the method of checking the calibration of the meter by means of a crystal oscillator.

(10 *marks*)