City and Guilds of London Institute

December Series, 1968

Radio Amateurs' Examination

Tuesday, December 3rd, 1968, 6.30 to 9.30 p.m.

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.

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 concerning:
    (*a*) the premises at which a Licensee may establish and use his station,
    (*b*) the purposes for which the station may be used?

2. Describe with the aid of diagrams ONE example of each of the following devices suitable for use in reducing interference by amateur sound transmitters to broadcast reception (sound and television):

(*a*) a high pass filter,
(*b*) a low pass filter,
(*c*) a mains filter.

In what circumstances would each be used and where would it be installed?

PART II

3. What is meant by:

(*a*) a permanent magnet,
(*b*) an electromagnet?

With the aid of diagrams explain the construction and action of *either* an electromagnetic relay *or* a moving coil loudspeaker.

4. With the aid of diagrams describe the working of a voltage stabilised thermionic valve or semi-conductor power pack suitable for supplying power to the oscillator stage of an amateur radio transmitter.

5. Describe the construction and operation of an absorption wavemeter for use in the frequency range 1·5 MHz to 30 MHz.

Explain how it can be used for the detection of emissions from a transmitter.

6 Describe THREE methods of coupling two tuned radio frequency circuits. Explain with the aid of sketch curves how the degree of coupling affects the frequency response.

Why is a band-pass characteristic desirable in the case of i.f. transformers in superheterodyne sound receivers?

7 Draw the circuit diagram of a valve or transistor tuned radio frequency receiver having stages of both r.f. and a.f. amplification and capable of the reception of continuous wave morse signals (type A1 emissions).

Explain the working of the receiver when receiving type A1 emissions and say why precautions must be taken to ensure that interference is not caused to other nearby receivers.

8. What is meant by:

(*a*) amplitude modulated double sideband telephony (A3),

(*b*) amplitude modulated single sideband suppressed carrier telephony (A3J)?

With the aid of a circuit diagram describe one method of amplitude modulation used in an amateur sound transmitter.

9. Define the unit of capacitance. Upon what factors does the capacitance of a capacitor depend?

Three capacitors of 2·5 μF, 2·5 μF and 5 μF respectively are connected:

(*a*) in series,

(*b*) in parallel.

What is the total capacitance in each case?

What quantity of electricity would be stored in each instance if the combinations were charged to a potential difference of 100V?

10. What is the speed of travel of radio waves in space?

What is the relationship between velocity, frequency and wavelength of a wave motion?

What is the frequency of waves in free space of the following wavelengths:

(*a*) 30 metres,

(*b*) 150 metres,

(*c*) 1·5 metres?

The velocity of propagation in a coaxial cable is 2×10^8 metres per second. What is the wavelength of a signal at 144 MHz when travelling through this cable?