055/1/01-02 (May)

City and Guilds of London Institute

May-June Series, 1968

Radio Amateurs' Examination

Tuesday, May 21st, 1968, 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 as regards
   (*a*) frequency control and measurement,
   (*b*) the entries to be made in the log,
   (*c*) the classes of emission permissible in the amateur bands between 3·5 MHz (3·5 Mc/s) and 29·7 MHz (29·7 Mc/s),
   (*d*) the maximum d.c. input power permissible in these bands?
   (15 *marks*)

2. Describe *two* types of spurious emission which can be emitted by radio transmitters.
   Explain how they can be suppressed to such a level that they cause no undue interference with any other wireless telegraphy.
   (15 *marks*)

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PART II

Answer SIX *questions in this part*

3. Describe the construction of a triode thermionic valve. Explain how the anode current is controlled by the potential of the grid with respect to the cathode, assuming that the anode potential remains constant.

   What is meant by the *mutual conductance* of a thermionic valve?

   (10 *marks*)

4. What do you understand by the *flow of electric current* in a circuit? State and define the practical units of

   (*a*) quantity of electricity,

   (*b*) current flow of electricity.

   A current of 250 mA flows in a circuit. What quantity of electricity will pass a given point in 10 seconds?

   (10 *marks*)

5. What is meant by the *piezo-electric effect* of a quartz crystal?

   With the aid of a circuit diagram explain the action of a crystal oscillator.

   (10 *marks*)

6. Describe how the impedance of a rejector, or parallel tuned circuit, varies with frequency near resonance. Sketch a curve to illustrate your answer.

   What is the dynamic resistance (impedance) offered by a rejector circuit at resonance if the circuit consists of a capacitor of 50 pF and an inductor of 10 μH which has an r.f. resistance of 10Ω?

   (10 *marks*)

7. Describe with the aid of a circuit diagram the action of the output stage of a receiver.

   Explain how the audio output impedance of the stage is matched to the impedance of the loudspeaker.

   (10 *marks*)

8. What ranges are normally obtainable in winter when using an amateur transmitter in daylight on

   (*a*) 1·9 MHz (1·9 Mc/s),

   (*b*) 7 MHz (7 Mc/s),

   (*c*) 14 MHz (14 Mc/s)?

   What differences would you expect to find in the summer?

   (10 *marks*)

9. Describe carefully, with diagrams, the construction of a dipole aerial and feeder for the 7 MHz (7 Mc/s) band.

   How would you ensure that the dipole acted as an effective radiator?

   (10 *marks*)

10. Describe the use of a cathode ray oscilloscope as a modulation monitor for a radiotelephony transmitter. Show with the aid of a block diagram how the oscilloscope is coupled to the transmitter. Sketch the waveforms you would expect from a double side-band amplitude-modulated wave (A3) with

    (*a*) 70% modulation,

    (*b*) 100% modulation,

    (*c*) over 100% modulation,

    when modulated with a sine wave.

    (10 *marks*)