55/1 (Dec.)

City and Guilds of London Institute

1966-7

Radio Amateurs' Examination

Thursday, December 8th, 1966, 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 the call-sign to be used
   (a) at alternative premises,
   (b) at temporary premises,
   (c) at a temporary location ?
   When is the call-sign to be sent ?
   In what circumstances, and at what intervals, should particulars of the location or address be sent ?
   At what Morse speed should the call-sign be sent ?
   How may the letters of the call-sign be confirmed by radio telephony ?
   Give six examples from the recommended phonetic alphabet.
   (15 marks)

2. What is meant by overmodulation of an amplitude modulated transmitter and in what way does it cause interference to other transmissions ?
   (15 marks)

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PART II

Answer SIX questions in this part

3. Describe with the aid of a block diagram a c.w. transmitter for use in the amateur bands 3.5 Mc/s to 28 Mc/s.
   Draw the circuit diagram of a frequency multiplier stage and explain its action. *(10 marks)*

4. Why are primary cells unsuitable for use in cases where currents of several amperes are required ?
   Why should dry batteries be removed from equipment as soon as they are exhausted ?
   A battery of four primary cells in series, each having an e.m.f. of 1.5V and an internal resistance of 1 ohm, is connected to a 6V, 1W lamp. What current will flow from the battery ? *(10 marks)*

5. Describe the construction of a power transformer capable of providing one output of 360V at 100mA and one output of 6.3V at 2A from a mains source of 240V a.c. at 50 c/s.
   What is the turns ratio for each secondary ?
   What is meant by magnetising current ?
   What would be the current in the primary if the two secondaries are each passing their full rated output ? Disregard the losses. *(10 marks)*

6. What is an artificial aerial and what is its use in an amateur transmitting station ?
   Describe, with diagrams, an artificial aerial suitable for use in the H.F. amateur bands and capable of dissipating up to 150W. *(10 marks)*

7. Describe a directional aerial system for use on 28 Mc/s and show with diagrams how it could be effectively coupled to a transmitter. *(10 marks)*

8. Describe, with the aid of a diagram, the action on ONE of the following:
   (a) a push-pull power amplifier stage for a low-power H.F. transmitter;
   (b) a push-pull power amplifier stage for the modulator of an amplitude modulated radio telephony transmitter. *(10 marks)*

9. Draw the circuit diagram of a beat-frequency oscillator. Show how its output is coupled to a superheterodyne receiver and explain its action when used for the reception of c.w. signals. *(10 marks)*

10. What is meant by the electric field and the magnetic field of an electro-magnetic wave ?
    What is meant by the polarisation of an electro-magnetic wave ? *(10 marks)*