

CITY AND GUILDS OF LONDON INSTITUTE

PAPER NUMBER 0 5 5 - 1 - 0 1/0 2	EXAMINATION RADIO AMATEURS' EXAMINATION	Tuesday 9 May 1972
SERIES MAY—JUNE 1972	PAPER WRITTEN	6.30 to 9.30 pm 3 hours
YOU SHOULD HAVE THE FOLLOWING FOR THIS EXAMINATION one answer book 'Castle's Logs'		

This examination is divided into two parts; failure in either part will carry with it failure in the examination as a whole.

The maximum mark for each question is shown.

Answer EIGHT of the following ten questions as follows: BOTH questions in PART I (which are compulsory) and SIX questions in Part II.

PART I — Answer BOTH questions in this part

1. (a) State the THREE purposes for which an amateur sound station may be used.
(b) What types of (i) messages, and (ii) signals may be sent and received?
(c) What precautions concerning aerials should be observed when operating a station from a public electricity supply?
(d) What precautions must be observed when siting transmitting aerials in the vicinity of airfields, power lines and television receiving aerials?

(15 marks)

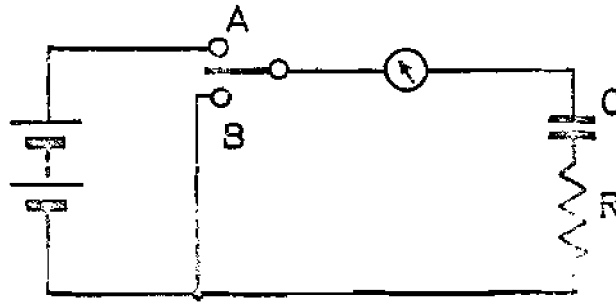
2. (a) (i) What is meant by overmodulation of the output from an amplitude modulated transmitter?
(ii) What are the undesirable effects arising from overmodulation?
(b) Describe, with the aid of diagrams, a method of monitoring an amplitude modulated transmitter so as to ensure that overmodulation does not occur and explain how the monitoring system functions.

(15 marks)

PART II — Answer SIX questions in this part

3. (a) Describe the principle of operation of a semi-conductor device suitable for use as an amplifier at audio or high frequencies.
(b) Sketch typical characteristic curves for a transistor operating in the common emitter mode and describe, with the aid of a circuit diagram, how these curves can be plotted.

(10 marks)



4. (a) Describe the charge and discharge of the capacitor in the above circuit when the switch is first moved to contact A for long enough for the capacitor to become charged and is then moved to contact B.
 (b) What factors determine
 (i) the capacitance of a capacitor
 (ii) the maximum voltage to which it can be charged?
 (10 marks)
5. The tuned anode circuit or tank circuit of a transmitter power amplifier consists of a capacitor of $100 \mu\text{F}$ connected in parallel with an inductor of $100 \mu\text{H}$. The r.f. resistance of the circuit is 20Ω .
 (a) To what frequency is the circuit tuned and what is the dynamic resistance of the circuit?
 (b) What causes the 'dip' in anode current as the circuit is tuned to resonance?
 (10 marks)
6. (a) What is the function of the detector stage in a radio receiver?
 (b) Describe, with the aid of waveform diagrams, the operation of a detector when receiving
 (i) amplitude modulated telephony (a.m.)
 (ii) continuous wave telegraphy (c.w.).
 Why is a heterodyne oscillation necessary in the latter case?
 (10 marks)
7. (a) Explain what is meant by 'Class-C' operation of an amplifier valve.
 (b) Draw the circuit diagram of a valve amplifier, operating at radio frequencies in the Class-C condition, including
 (i) meters to check the r.f. drive to the stage, the anode current and the h.t. voltage, and
 (ii) details of the various power supplies.
 (10 marks)
8. (a) Draw polar diagrams of the following aerials in the horizontal plane
 (i) a horizontal half wave dipole
 (ii) a vertical half wave dipole
 (iii) a dipole, reflector and director array of the type commonly used on high or very high frequencies.
 (b) Briefly describe how the directional effects are achieved in ONE of the above aerials.
 (10 marks)
9. The h.f. propagation predictions for September 1971 forecast that for communication between the United Kingdom and South Africa the 14 MHz band would prove most usable by night and the 21 MHz band by day. Explain why this is so.
 (10 marks)
10. (a) (i) Explain why ammeters and voltmeters designed for use on direct current cannot be used for measuring alternating current.
 (ii) Explain why meters for use on a.c. power supplies at 50 Hz cannot be used with any accuracy at audio and radio frequencies.
 (b) With a circuit diagram show how a d.c. meter can be adapted for a.c. measurements.
 (c) State ONE type of meter that can be used at radio frequencies.
 (10 marks)