

# CITY AND GUILDS OF LONDON INSTITUTE

PAPER NUMBER <b>765-1-01/02</b>	EXAMINATION <b>RADIO AMATEURS' EXAMINATION</b>	<b>Monday 3 December 1973</b>
SERIES <b>DECEMBER 1973</b>	PAPER <b>WRITTEN</b>	<b>6.30 to 9.30 pm 3 hours</b>
YOU SHOULD HAVE THE FOLLOWING FOR THIS EXAMINATION  <b>one answer book 'Castle's Logs'</b>		

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) The Amateur (Sound) Licence states that the establishment and use of an amateur sound station is subject to six specific limitations. State FIVE of these.  
(b) What are the two requirements of the Amateur (Sound) Licence as regards frequency control and measurement? (15 marks)
  
2. (a) Why is it necessary to limit the range of audio frequencies when modulating an amateur radio telephony transmitter?  
(b) What approximate range of audio frequencies is necessary for the effective transmission of speech?  
(c) Describe one way by which the audio bandwidth of the modulation applied to an amateur radio telephony transmitter may be restricted to this range. (15 marks)

## PART II – Answer SIX questions in this Part

3. (a) Explain what is meant by  
(i) a permanent magnet  
(ii) an electromagnet.  
(b) Describe the operation of EITHER a headphone earpiece OR a moving-coil loudspeaker. (10 marks)
  
4. (a) Describe the principle of operation of a transformer.  
(b) Compare the construction of a radio frequency transformer with that of an audio frequency transformer. (10 marks)
  
5. (a) Draw the circuit diagram of a power pack having an output of 2 A d.c. at 20 V.  
(b) How is smoothing of the d.c. output achieved? Explain this action. (10 marks)

6. (a) State what is meant by EACH of the following  
 (i) a double-sideband, amplitude-modulated wave  
 (ii) a single-sideband, suppressed-carrier, amplitude-modulated wave  
 (iii) a frequency-modulated wave.  
 (b) Draw BLOCK DIAGRAMS of receivers suitable for the reception of EACH of the types of emission mentioned in (a), and name the principal stages. (10 marks)
7. (a) Draw the circuit diagram of a frequency multiplier stage suitable for use in an amateur sound transmitter.  
 (b) Describe carefully how frequency multiplication is achieved. (10 marks)
8. (a) What is the wavelength in free space of a radio wave having a frequency of 7050 kHz? (Give your answer correct to two decimal places.)  
 (b) What is the wavelength of this signal when travelling along a feeder having a velocity of propagation of  $2 \times 10^8$  metres per second? (10 marks)
9. (a) Sketch the construction of a half-wave dipole aerial suitable for use in the 7 MHz band. Show on your diagram the feeder, aerial tuning unit and all necessary insulators and give the principal dimensions.  
 (b) What type of aerial tuning unit and feeder would be required if it was intended to use an aerial of similar dimensions as a full-wave dipole in the 14 MHz band? Draw the circuit diagram of such a unit. (10 marks)
10. (a) Describe, with the aid of sketches, the construction of an absorption wavemeter suitable for use in the v.h.f. range 65 MHz to 230 MHz.  
 (b) How would you calibrate the instrument using EITHER a calibrated receiver OR a receiver and test oscillator? (10 marks)