

# CITY AND GUILDS OF LONDON INSTITUTE

PAPER NUMBER <b>055-1-01/02</b>	EXAMINATION <b>RADIO AMATEURS' EXAMINATION</b>	Monday <b>6 December 1971</b>  6.30 to 9.30 pm <b>3 hours</b>
SERIES <b>DECEMBER 1971</b>	PAPER	
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

- What is the meaning of the expression 'wireless telegraphy' as used in the Amateur (Sound) Licence?
  - What are the standards laid down in the Licence which must be observed by an amateur station for wireless telegraphy as regards non-interference, by spurious emission or poor frequency stabilisation, with any other wireless telegraphy?

(15 marks)
- Draw the circuit diagram of the power amplifier stage of an amateur transmitter using a  $\pi$ -network output filter.
  - Explain how this circuit can be adjusted to match the output of the transmitter to a wide range of load impedances.
  - Why is the  $\pi$  network effective in minimising the radiation of harmonics?

(15 marks)

## PART II – Answer SIX questions in this Part

- In radio propagation what is meant by (i) maximum usable frequency (m.u.f.), and (ii) critical frequency?
  - What factors affect the frequencies in (a) above?

(10 marks)
- What is an alternating current of sinusoidal waveform?
  - What is meant by (i) the peak voltage value, and (ii) the r.m.s. voltage value, of an alternating supply?
  - If an alternating voltage of 10 V r.m.s. at a frequency of 159 kHz is applied across a capacitor of 0.01  $\mu$ F what current would flow in the circuit?

(10 marks)
- When an e.m.f. is applied across a conductor an electric current flows. What is understood by the term 'electric current'?
  - Why are some materials known as insulators and some as conductors and what is the difference between them?
  - How is the current flowing in a circuit related to the resistance of the circuit and to the voltage applied to it?

(10 marks)

See next page

6. (a) With the aid of waveform diagrams describe the action of the frequency changer stage of a superheterodyne receiver for the high frequency bands.  
(b) Describe briefly how the tuning of the signal and oscillator circuits is kept in step over the tuning range of the receiver, using a single control. (10 marks)
7. (a) With the aid of diagrams describe the construction of a power pack suitable for providing  
6 A at 6.3 V for valve heaters  
200 mA at 500 V for power amplifier high tension supply  
20 mA at 150 V stabilised for oscillator high tension supply —100 V grid bias supply  
from a 250 V, 50 Hz a.c. source of supply.  
(b) With the aid of waveform diagrams describe how rectification is achieved. (10 marks)
8. (a) Describe how a cathode-ray oscilloscope can be used for the examination of electric voltage waveforms.  
(b) With the aid of diagrams show how the oscilloscope can be used to monitor the waveform of the modulated radio frequency output from a sound transmitter. (10 marks)
9. (a) Describe how a quartz crystal can be used to control the frequency of an oscillator.  
(b) Draw the circuit diagram of a typical crystal oscillator for use in a high frequency transmitter and describe its action. (10 marks)
10. What is meant by EACH of the following terms when applied to radio frequency transmission lines?  
(a) Open wire feeder.  
(b) Coaxial feeder.  
(c) Velocity factor.  
(d) Characteristic impedance.  
(e) Standing wave ratio. (10 marks)