



QUESTION WORKBOOK

Rectification and smoothing

Magnetic fields · Year 13

CIE 21.2

11 questions · 29 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

- A1** State the function of a diode in a circuit and explain why a single diode in series with an alternating supply produces half-wave rectification. [2]

- A2** Sketch the output of a half-wave rectifier fed with a sinusoidal input, and the output of a full-wave rectifier fed with the same input. Label the difference between them. [2]

- A3** State one disadvantage of half-wave rectification compared with full-wave rectification, and one advantage in terms of components. [2]

SECTION B · Standard

- B1** A bridge rectifier contains four diodes. Explain how it produces full-wave rectification. Refer to which diodes conduct in each half-cycle. [3]

B2 Explain how a capacitor connected across the load smooths the output of a full-wave rectifier. [3]

B3 A smoothing capacitor of $2200\ \mu\text{F}$ discharges through a load of $500\ \Omega$. Calculate the time constant of the discharge. [2]

B4 State and explain the effect on the ripple of a smoothed supply of increasing the capacitance of the reservoir capacitor. [2]

B5 A smoothed power supply works well with a $2.0\ \text{k}\Omega$ load. Explain why the ripple increases when the load is changed to $200\ \Omega$. [2]

SECTION C · Stretch

- C1** A full-wave rectified 50 Hz supply is smoothed by a $470\ \mu\text{F}$ capacitor across a $1.0\ \text{k}\Omega$ load. Calculate the time between successive peaks and the discharge time constant, and use the two values to justify whether the smoothing is effective.

[4]

- C2** An unsmoothed full-wave rectifier is fed from a supply of rms voltage 12 V. State the peak output voltage, and describe how the smoothed output would sit relative to the unsmoothed humps if both were drawn on the same axes.

[3]

- C3** A $100\ \mu\text{F}$ capacitor smooths a full-wave rectified 50 Hz supply across a $2.0\ \text{k}\Omega$ load. Calculate the fraction of the peak voltage remaining after one 10 ms interval between peaks, and comment on the size of the ripple.

[4]