2021 Ph H2 Q13

Section: Electricity

Topic: Monitoring and Measuring a.c.

A signal generator is connected to an oscilloscope. (a) State what is meant by an alternating current. (b)(i) Determine peak voltage given Y-gain = 5.0 V/div. (b)(ii) Determine frequency given timebase = 1.0 ms/div. (c) Sketch trace when diode is added (half-wave rectification).

Worked solution

(a) An alternating current (a.c.) is one which repeatedly changes direction, and its magnitude varies continuously with time.

(b)(i) Peak voltage

Peak amplitude = 2.6 divisions × 5.0 V/div = 13 V.

Answer: 13 V

(b)(ii) Frequency

One cycle occupies 4 divisions × 1.0 ms/div = 4.0 ms.
$f = 1/T = 1/(4.0\times10^{-3}) = 250$ Hz

Answer: 250 Hz

(c) With a diode, current flows only in one direction. The negative half-cycles are removed, leaving only the

positive half-cycles. On the oscilloscope trace, this appears as a sine wave where the negative halves are missing (half-wave rectification).

Final answers

(a) a.c. = current that changes direction

(b)(i) $V_{peak} \approx 13$ V

(b)(ii) $f \approx 250$ Hz

(c) Trace shows half-wave rectified signal (positive halves only)

Revision tips

- Oscilloscope Y-gain gives voltage per division; timebase gives time per division.
- Peak voltage = amplitude in divisions × V/div.
- Period T = divisions × time/div; frequency f = 1/T.
- A.c. changes direction; d.c. flows in one direction.
- Diode converts a.c. to half-wave rectified output.