21. Alternating Currents

21.2 Rectification and smoothing

Paper 4

Marking Scheme

Q1.

(a)	rectification (of the input voltage)	**M1**
	full-wave	**A1**
(b)(ii)	sinusoidal shape with minima sitting on the time axis	**B1**
	correct frequency and phase, with minima at 0, 0.02, 0.04, 0.06 and 0.08 s and maxima at 0.01, 0.03, 0.05 and 0.07 s	**B1**
	all maxima shown at 0.22 W	**B1**

Q2.

(a)(i)	conversion (from a.c.) to d.c.	**B1**
(a)(ii)	half-wave: voltage in one direction is removed	**B1**
	full-wave: voltage in one direction is reversed	**B1**
(b)(i)	one gap connected by a single diode and other gap connected directly	**B1**
	diode drawn (in a circuit) with correct circuit symbol	**B1**
(b)(ii)	smoothing	**B1**

Q3.

(a)(i)	correct circuit symbol for a diode shown correctly connected in series with the wires leading into and out of the dotted box	**B1**
(a)(ii)	smoothing / V_{OUT} is smoothed	**B1**
(c)	V_{IN} has constant magnitude in both positive and negative directions	**B1**
	(so) V_{OUT} is (now) constant / V_{OUT} does not vary with time	**B1**

Q4.

(a)(i)	full-wave (rectification)	**B1**
(a)(ii)	lower left diode shown pointing left	**B1**
	lower right and upper left diodes shown pointing left	**B1**
(a)(iii)	arrow indicating current direction in resistor to the right	**B1**
(b)(i)	sketch: periodic line showing minimum $V_{OUT} = 0$ and maximum $V_{OUT} = +V_0$	**B1**
	line showing peak V_{OUT} at $t = 0$, $0.5T$, $1.0T$, $1.5T$ and $2.0T$, with V_{OUT} going to zero half-way in between each peak	**B1**
	line showing correct modulated sine shape	**B1**

Q5.

(a)(i)	conversion (from a.c.) to d.c.	**B1**
(a)(ii)	full-wave (rectification)	**B1**
(b)(i)	P labelled – **and** Q labelled +	**B1**
(c)(i)	correct symbol used for capacitor and capacitor connected in parallel with the 1.2 kΩ resistor.	**B1**
(c)(ii)	straight lines or curves, with negative decreasing gradients, drawn between adjacent peaks, from top of first peak to meet line going up to next peak	**B1**
	lines, from one peak to the line going up to the next peak, show a drop in p.d. of 1½ small squares	**B1**

Q6.

(a)(i)	lower right **and** upper left diodes circled	**B1**
(b)(i)	correct symbol for capacitor, shown connected in parallel with R	**B1**
(b)(ii)	**1.** (ripple) decreases	**B1**
	2. (ripple) increases	**B1**