9 **(a)** The output of a power supply is represented by:

$$V = 9.0 \sin 20t$$

where V is the potential difference in volts and t is the time in seconds.

Determine, for the output of the supply:

(i) the root-mean-square (r.m.s.) voltage, $V_{r.m.s.}$

$V_{r.m.s}$ = ...V [1]

(ii) the period T.

T = ... s [2]

(b) The variations with time t of the output potential difference V from two different power supplies are shown in Fig. 9.1 and Fig. 9.2.

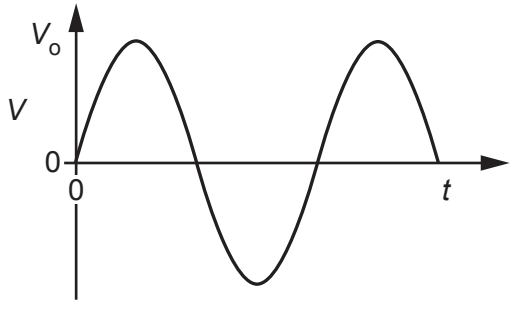

Fig. 9.1

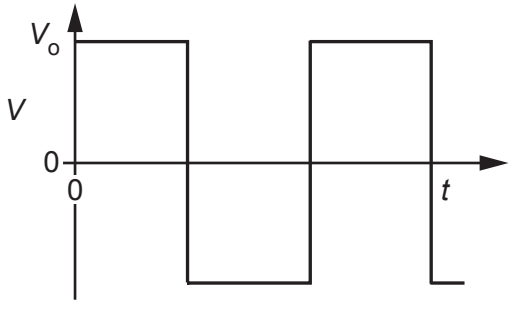

Fig. 9.2

The graphs are drawn to the same scale.

State and explain whether the same power would be dissipated in a 1.0 Ω resistor connected to each power supply.

.....

.....

..... [1]

(c) (i) The power supply in **(a)** is connected to a transformer. The input power to the transformer is 80 W.

The secondary coil is connected to a resistor. The r.m.s. voltage across the resistor is 120 V. The r.m.s. current in the secondary coil is 0.64 A.

Calculate the efficiency of the transformer.

efficiency = ... [3]

(ii) State **one** reason why the transformer is not 100% efficient.

.....

..... [1]

[Total: 8]