Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

(a) (i) $230 \times \sqrt{2} = 325$ (V) ✔
(2 × 325 =) 650 to 651 V ✔

allow doubling their incorrect peak voltage (162.6 × 2) by use of $\sqrt{2}2$
as an attempt to find peak-to-peak for 1 mark but not just 2 × 230

2

(ii) *(use of* $P = V^2/R$*)*
$P = 230^2/12$ ✔
$P = 4.4 \times 10^3$ (W)✔ cao
2 sig. figs. Incorrect <u>answer must be supported by working</u> ✔

Allow their incorrect answer (a)(i)$^2 \div 12$
Or $325^2 \div 12$ *as a use of for 1 mark*
Alternative
For first mark
$I = \frac{V}{R}$ ***and*** *P=VI allowing their incorrect answer*
(a)(i) or 325 as sub for V for 1 mark
Answers 8.8 kW (325V) and 35 kW (650V)

3

(b) (i) there is a pd / voltage across the cable ✔
pd / voltage across cooker is 230 V minus this pd / voltage ✔
2nd mark depends on 1st mark in all

The current is lower due to the resistance of cable / The current is lower as circuit resistance increases ✔
pd across oven is lower <u>since</u> V=I × Resistance of element ✔
or
Resistance of the cable is in series with element ✔
Voltage splits (in ratio) across these resistances ✔

2

(ii) resistance of cable = 2 × 3.15 × 0.0150 = 0.0945 ✔

Allow power 10 error here

$V = \frac{12}{12 + R_{cable}} \times 230$ ✔

Or $I = \frac{230}{12 + R_{cable}}$ **and** $V = \left(\frac{230}{12 + R_{cable}}\right) \times 12$

=228 V ✔ cao

Downloaded from www.merit-minds.com

Allow their incorrect R_{cable} correctly substituted for 2nd marking

3

(iii) 230 − their (b) (ii) or 19 (A) quoted for current or equivalent seen in equation (230 / 12.0945) ✔

(P =) 34.2 to 42.3(W) ✔ correct working

ecf as P = (230- (b)(ii))^2 / their R_{cable}

2

(iv) minimise power loss / maximise efficiency of oven / ensure element gets as hot as possible ✔
avoid overheating / fires ✔

not just to carry a large current / larger pd across element
Either order

2

[14]

Q2.

(a) (i) meter deflects then returns to zero ✓
current produces (magnetic) field / flux ✓
change in field / flux through Q induces emf ✓
induced emf causes current in Q (and meter) ✓

Deflection to right (condone left) then zero is equivalent to 1st mark.
Accept momentary deflection for 1st point.
"Change in field / flux induces current in Q" is just ✓ from the last two marking points.

max 3

(ii) meter deflects in opposite direction (or to left, or ecf) ✓
field / flux through P is reduced ✓
induces emf / current in opposite direction ✓

Ignore references to magnitude of deflection.

max 2

(b) (i) flux linkage (= $n\Phi = nBA$) = 40 × 0.42 × 3.6 × 10 $^{-3}$
= 6.0(5) × 10^{-2} ✓

Unit mark is independent.
Allow 6 × 10^{-2}.

Wb turns ✓

Accept 60 mWb turns if this unit is made clear.
Unit: allow Wb.

2

(ii) change in flux linkage = $\Delta(n\Phi)$= 6.05 × 10^{-2} (Wb turns) ✓

induced emf $\left(=\frac{\Delta(n\phi)}{\Delta t}\right) = \frac{6.05 \times 10^{-2}}{0.50}$ = 0.12(1) (V) ✓

Essential to appreciate that 6.05 × 10^{-2} is change in flux linkage for 1st mark. Otherwise mark to max 1.

2

[9]

Downloaded from www.merit-minds.com