Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) ratio of charge to potential

C1

4.2 μC per volt etc

A1

2

(b) (i) method: time for voltage to half/tangent at origin/use of decay equation/1/e value

B1

appropriate reading from graph ($T_{½}$ = 440 or 450 μs)

B1

substitution into correct equation

B1

R correct for method (151/152/155 Ω)

B1

4

(ii) **B** smaller than **A M0**

B discharges faster/**A** discharges slower

B1

reference to decay equation/calculation for **B**

B1

2

(c) $E = ½ CV^2$ or $½ QV$ seen

C1

both 4.0 (V) and 0.9 (V)/16.8 (μC) and 3.8 (μC) seen

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C1

31.9 (μJ)

A1

3

[11]

Q2.

(a) (i) tangent drawn at $t = 0$

M1

coordinates correct and manipulated correctly
0.015 to 0.020 (A) 15 mA – 20 mA
or $V = 4000$ V as in (ii) then $I = 18$ mA

A1

2

(ii) $V = 220 \times$ their (i) condoning powers of 10

C1

about 4000 V (3300 – 4400 V)

A1

or use of $V = Q/C$; $V = 100$ mC/25 μF

C1

4000 V

A1

2

(iii) more charge leads to increased potential difference across the capacitor

M1

pd = $V_R + V_C$
or if V_C increases then V_R decreases

M1

(if V_R falls) so I falls

A1

3

(b) (i) use of energy = ½ Q^2/C or use of $C = Q/V$ and ½ QV

C1

0.083(7) or 0.084 C condone 0.083 C

A1

2

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(ii) power = 14 kW

B1

1

(c) time constant = 5.5 s

M1

sensible attempt to find the charge after 8.3 s – by calculation or reading from graph

M1

about 78 mC and needs to be 85 mC/has not reached 85 mC so designer's suggestion is not valid

A1

3

[13]

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