Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

(a) area of overlap of the plates

B1

separation of/distance between the plates

permittivity/dielectric constant of free space/the material/dielectric between the plates (condone of the gap)

B1

2

B1 for 1 factor clearly stated
B1 for other two clearly stated

(b) (i) $Q = VC$ (any form) or 0.047 μF × 12 (ignoring powers of 10)

C1

$5.6(4) \times 10^{-7}$ C (0.56 μC)

A1

(ii) time constant = 4.7×10^{-5} s or $0.01 = e^{-t/RC}$

C1

$0.01 = e^{-t/(0.000047)}$) or $0.01 = e^{-t/47}$ or = $\frac{t}{RC} = 4.605$

C1

$2.2\ (2.16) \times 10^{-4}$ s or 0.22 ms

A1

(iii) their (i) × 400 (230 (226) μA or 2.3×10^{-4} A if correct)

B1

6

[8]

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Q2.

(a) $1/C = 1/500 + 1/1000$ or $C = \frac{500 \times 1000}{500 + 1000}$

C1

330 (333) µF

A1

2

(b) (i) $Q = VC$ *or* $Q = 0.25 \times 9$

C1

2.3 or 2.25 C (c.a.o. unit essential)

A1

(ii) *energy* = ½ CV^2 or $0.5 \times 0.25 \times 9^2$ or ½ QV used

C1

10(.1) J (allow e.c.f. for Q)

A1

(iii) $V = V_o e^{-t/RC}$

C1

7

$0.1 = 9 e^{-t/(8.5 \times 0.25)}$

C1

9.6 (9.56) s

A1

(c) (i) $Q = mc\Delta\theta$ or mass = volume × density

C1

correct substitution $10.1 = (2.2 \times 10^{-7} \times 8900 \times 400 \times \Delta\theta)$

C1

12 (12.3) K or °C ecf for energy from (b) (ii)

A1

5

(ii) some energy raises temperature of the thermometer

B1

energy/heat lost to (raise temperature of) surroundings

B1

[14]

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