

*It is not departmental policy to provide complete specimen answers to past examination papers. However, to help you in revision, numerical values and similar information are given below so that you can check your attempts. If you have attempted past questions and wish to discuss the descriptive questions or the details of your calculations, please see me!*

*Dr Booth*

### Question 1

- a) Force is 86 N at  $36.9^\circ$  below negative  $x$ -axis. (Polar angle  $216.9^\circ$ .)
- b) Total capacitance is  $2C/3$ .
- e) i) Zero. ii)  $U = -p E \cos\theta$ .
- f) Time is 77.2 s.
- g) i)  $E = 530 \times 10^3 \text{ V m}^{-1}$ ;  $V = 2.7 \text{ kV}$ ; ii) time is 14 ns.

### Question 2

- a) Resistance is 301  $\Omega$ .
- b) Internal resistance 0.27  $\Omega$ ; EMF 12.9 V.
- d)  $\alpha = 6.28 \times 10^{-4} \text{ }^\circ\text{C}^{-1}$ ;  $R(0^\circ\text{C}) = 83.7 \Omega$ .

### Question 3

b)i)  $E = \frac{\rho r}{2\epsilon_0}$ .

ii)  $E = \frac{\rho a^2}{2\epsilon_0 r}$ .

d) For  $r \geq a$ ,  $V = \frac{\rho a^3}{3\epsilon_0 r}$ ; for  $r < a$ ,  $V = \frac{\rho a^2}{6\epsilon_0} \left( 3 - \frac{r^2}{a^2} \right)$ .