7 **(a)** Prove that $\sin^2 2x + 4\cos^2 x \cos 2x \equiv 4\cos^4 x$. [3]

(b) Find the set of possible values of the constant k for which the equation

$$\sin^2 2x + 4\cos^2 x \cos 2x + 5 = k$$

has no real solutions. [2]

(c) Find the exact value of $\int_{-\frac{1}{3}\pi}^{\frac{1}{3}\pi} \sqrt{\sin^2 t + 4\cos^2\left(\frac{1}{2}t\right)\cos t}\,\mathrm{d}t$. [4]

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.