3 The quartic equation $x^4 + 7x^2 + 3x + 22 = 0$ has roots $\alpha, \beta, \gamma, \delta$.

(a) Find the value of $\alpha^2 + \beta^2 + \gamma^2 + \delta^2$. [2]

(b) Find the value of $\alpha^4 + \beta^4 + \gamma^4 + \delta^4$. [2]

(c) Use standard results from the list of formulae (MF19) to find the value of

$$\sum_{r=1}^{10}\left(\left(\alpha^2 + r\right)^2 + \left(\beta^2 + r\right)^2 + \left(\gamma^2 + r\right)^2 + \left(\delta^2 + r\right)^2\right).$$ [5]