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4. At time t seconds ($0 \leqslant t < 5$), a particle P has velocity $\mathbf{v}\,\text{m s}^{-1}$, where

$$\mathbf{v} = \left(\sqrt{5 - t}\right)\mathbf{i} + \left(t^2 + 2t - 3\right)\mathbf{j}$$

When $t = \lambda$, particle P is moving in a direction parallel to the vector $\mathbf{i}$.

(a) Find the acceleration of P when $t = \lambda$

(5)

The position vector of P is measured relative to the fixed point O
When $t = 1$, the position vector of P is $(-2\mathbf{i} + \mathbf{j})$m.

Given that $1 \leqslant T < 5$

(b) find, in terms of T, the position vector of P when $t = T$

(5)

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Q4

(Total 10 marks)