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**5.** [*In this question* **i** *and* **j** *are perpendicular horizontal unit vectors.*]

A particle $P$ is moving with constant acceleration. At 2 pm, the velocity of $P$ is $(3\mathbf{i} + 5\mathbf{j})$ km h$^{-1}$ and at 2.30 pm the velocity of $P$ is $(\mathbf{i} + 7\mathbf{j})$ km h$^{-1}$

At time $T$ hours after 2 pm, $P$ is moving in the direction of the vector $(-\mathbf{i} + 2\mathbf{j})$

(a) Find the value of $T$.

**(6)**

Another particle, $Q$, has velocity $\mathbf{v}_Q$ km h$^{-1}$ at time $t$ hours after 2 pm, where

$$\mathbf{v}_Q = (-4 - 2t)\mathbf{i} + (\mu + 3t)\mathbf{j}$$

and $\mu$ is a constant.

Given that there is an instant when the velocity of $P$ is equal to the velocity of $Q$,

(b) find the value of $\mu$.

**(3)**

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**Question 5 continued**

**Q5**

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