**3**



A particle of mass $m$ is attached to one end of a light inextensible string of length $a$. The other end of the string is attached to a fixed point $O$. The point $A$ is such that $OA = a$ and $OA$ makes an angle $\alpha$ with the upward vertical, where $\tan \alpha = \frac{12}{5}$. The particle is projected downwards from $A$ with speed $u$ perpendicular to the string and moves in a vertical plane (see diagram). The string becomes slack after the string has rotated through 270° from its initial position, with the particle now at the point $B$.

**(i)** Show that $u^2 = 2ag$. [5]

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**(ii)** Find the maximum tension in the string as the particle moves from $A$ to $B$. [4]

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..............Find the maximum tension in the string as the particle moves from $A$ to $B$..............[4]