Duration :-   One and Half Hours.

Date :- 30-10-2007.   **Time:- 01.30 p.m. – 03.00 p.m.**

Answer all questions.

01. A particle P of mass 5kg lies on a smooth inclined plane of angle $\theta = \arcsin\frac{3}{5}$ (that is $\sin\theta = \frac{3}{5}$). Particle P is connected to a particle Q of mass 4kg by a light inextensible string which lies along a line of greatest slope of the plane and passes over a smooth peg. The system is held at rest with Q hanging vertically 2m above a horizontal plane. The system is now released from rest. Assuming P does not reach the peg,

   find

   (a) the initial acceleration of Q

   (b) how long it takes for Q to hit the horizontal plane

   (c) the total distance that P move up the plane.

02. A golf ball is struck the point T, at the top of a lift 49m above the sea level, with a speed of 14ms^{-1} at an angle of $45°$ to the horizontal, as shown in the diagram. The point O is at sea level and vertically below T. The point A is the highest point reached by the ball in its motion. The ball strikes the sea at the point B
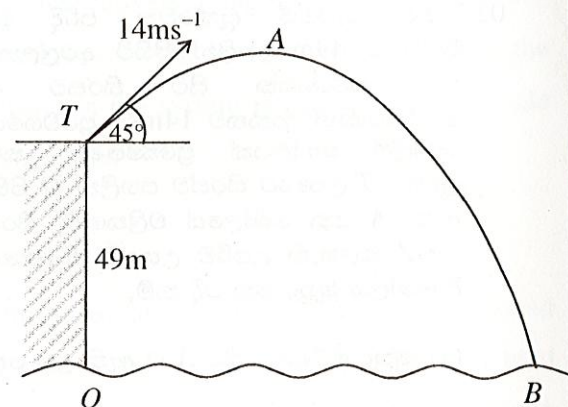
   (a) find the height A above sea level

   (b) find the distance OB.

03.(i) The diagonal of a plane quadrilateral $XYZW$ intersect at O. A, B the mid point of the diagonal XZ and YZ respectively, show that

   (a) $\frac{1}{2}\left(\overrightarrow{YX} + \overrightarrow{YZ}\right) = \overrightarrow{YA}$ (b) $\overrightarrow{YX} + \overrightarrow{YZ} + \overrightarrow{WX} + \overrightarrow{WZ} = 4\overrightarrow{BA}$.

   (ii) If $\underline{a} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{b} = \underline{i} - \underline{j} + \underline{k}$ find the $\underline{a} \cdot \underline{b}$ and hence find the acute angle between vectors $\underline{a}$ and $\underline{b}$.