Answer **all** the questions in the spaces provided.

1 As a ship is approaching the dock at 45.0 cm s^{-1}, an important piece of landing equipment needs to be thrown to it before it can dock. This equipment is thrown at 15.0 m s^{-1} at 60.0° above the horizontal from the top of a tower at the edge of the water, 8.75 m above the ship's deck as shown in Fig. 1.1.

For this equipment to land at the front of the ship's deck, the distance from the dock to the ship when the equipment is thrown should be *D* as shown in Fig.1.1

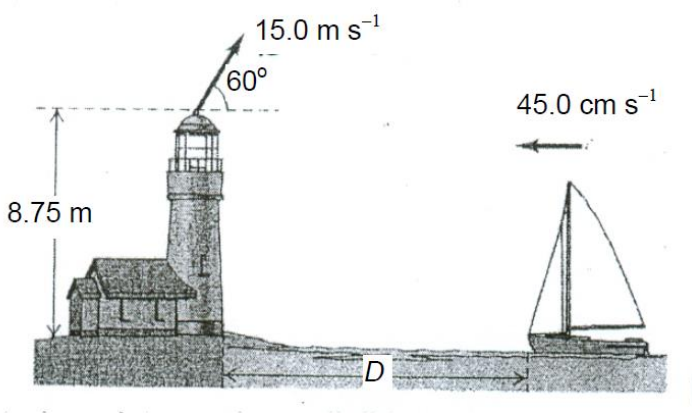

Fig 1.1

(a) Assuming that air resistance is negligible.

(i) Show that the time of flight of the equipment is 3.21 s.

[1]

(ii) Hence, determine the value of *D*.

D = …… m [3]

(b) If air resistance is not negligible, comment on whether *D* should be longer or shorter.

……..

……..

……. [2]

(c) Sketch and label clearly on the same axes in Fig 1.2, a graph to show the variation with time of flight t of the vertical component of velocity V_y of the equipment during its flight if

(i) air resistance is negligible,

(ii) air resistance is not negligible.

For both graphs, take upwards direction as positive.

Fig 1.2

[4]

[Total: 10]