**1** Fig. 1.1 shows a force diagram that represents a boat that is being lifted by two ropes so that the boat remains horizontal and travels vertically upwards at a constant speed after leaving the water.

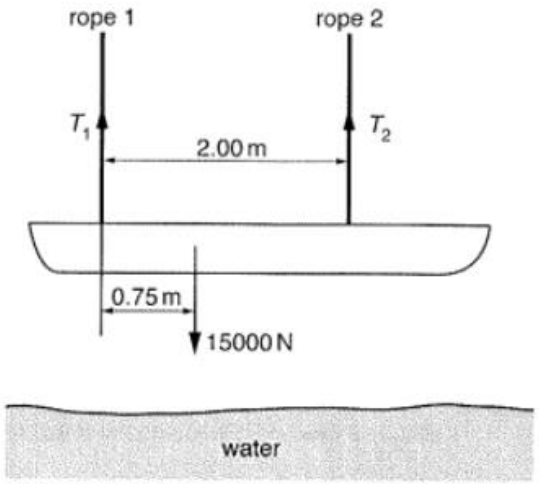


**Fig. 1.1**



DO NOT WRITE IN THIS MARGIN

The weight of the boat is 15000 N and the tensions in the ropes 1 and 2 are $T_1$ and $T_2$ respectively.

**(a)** The position of the centre of gravity of the boat is not at its midpoint. Suggest what this implies about the distribution of mass in the boat.

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..... [1]

**(b)** Explain two conditions required for the boat to be in a state of equilibrium while it is moving upwards.

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.....

.....

..... [2]

**(c)** Determine the tension in the two ropes

$T_1$ = ..... N

$T_2$ = ..... N [3]

**(d)** The two ropes are connected to a motor.
Calculate the minimum power generated by the motor to lift the boat off the water onto a 30.0 m cliff within a time of 12s.

$P$ = ..... W [2]

[Total: 8]