1 **(a)** Determine the SI base units of power.

SI base units of power ..... [3]

(b) Fig. 1.1 shows a turbine that is used to generate electrical power from the wind.

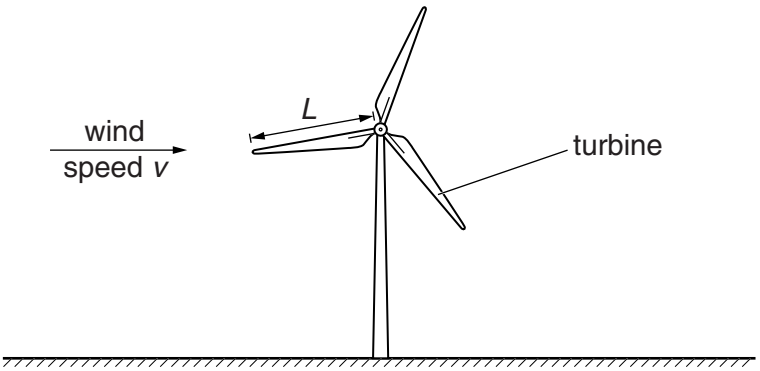

Fig. 1.1

The power P available from the wind is given by

$$P = CL^2\rho v^3$$

where L is the length of each blade of the turbine,
ρ is the density of air,
v is the wind speed,
C is a constant.

(i) Show that C has no units.

[3]

(ii) The length L of each blade of the turbine is 25.0 m and the density ρ of air is 1.30 in SI units. The constant C is 0.931.
The efficiency of the turbine is 55% and the electric power output P is 3.50×10^5 W.

Calculate the wind speed.

wind speed = ... $m\,s^{-1}$ [3]

(iii) Suggest two reasons why the electrical power output of the turbine is less than the power available from the wind.

1. .....

.....

2. .....

.....
[2]