3 Fig. 3.1 shows the drum of a front-loading washing machine. The drum has a radius of 0.230 m and spins at 1200 revolutions per minute when drying clothes. There are small holes in the drum to let the water escape.
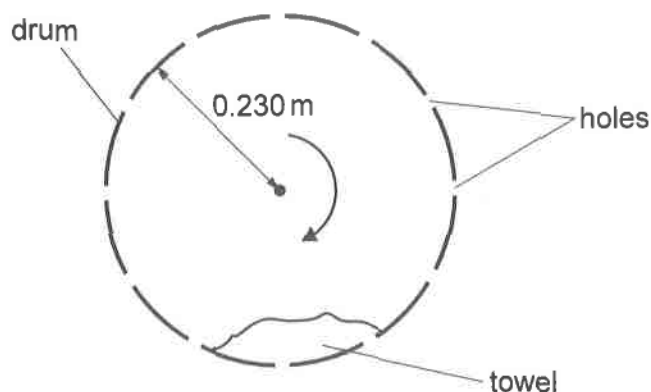
drum

0.230 m

holes

towel

Fig. 3.1

(a) (i) Calculate the angular speed ω of the drum.

ω = ... rad s^{-1} [2]

(ii) A towel has a mass of 1.20 kg and may be considered to be a point mass at the edge of the drum.

The drum is spinning at the angular speed calculated in (a)(i).

Calculate the force F exerted by the drum on the towel when the towel is at the bottom of the drum, as shown in Fig. 3.1.

F = ... N [3]

(iii) With reference to vibrations, and to your answer in **(a)(ii)**, suggest why washing machines have very large masses placed at their base.

....

....

....

....

....

.... [3]

(b) Explain, in terms of forces, why the water leaves the drum through the holes when the machine is spinning.

....

....

....

.... [2]

[Total: 10]