Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

5 Newton's laws of motion

Exercise B, Question 5

Question:

A package with mass 300 kg is lifted vertically upwards. Find the tension in the cable which lifts the package, when the package:

(a) accelerates upwards at 0.1 m s^{-2}

(b) accelerates downwards at 0.2 m s^{-2}

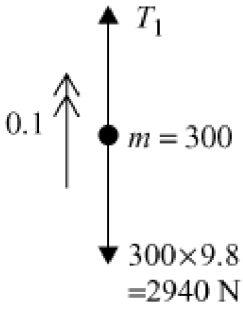
(c) travels upwards with a retardation of 0.1 m s^{-2}.

Solution:

(a) Newton's 2nd Law ↑

$$T_1 - 2940 = 300 \times 0.1$$
$$\therefore T_1 = 2940 + 30$$
$$T_1 = 2970$$

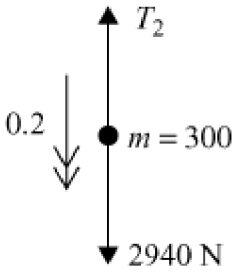
$\therefore$ tension is 2970 N (3 s.f.)



(b) Newton's 2nd Law ↓

$$2940 - T_2 = 300 \times 0.2$$
$$\therefore 2940 - 60 = T_2$$
$$\text{i.e. } T_2 = 2880$$

$\therefore$ tension is 2880 N (3 s.f.)



(c) Newton's 2nd Law ↓

$$2940 - T_3 = 300 \times 0.1$$
$$\therefore 2940 - 30 = T_3$$
$$\therefore T_3 = 2910$$

$\therefore$ tension is 2910 N (3 s.f.)