

Answer on Question #74533-Engineering-Mechanical Engineering

A lift cage of mass 826 kg accelerates uniformly upwards from rest to a velocity of 7 ms⁻¹ whilst travelling a distance of 36 m. The frictional resistance to motion is 244 N. Making use of the principle of conservation of energy, determine:

i) The work done

ii) The tension in the lifting cable

iii) The average power developed

Solution

i)

$$W = (mg + F_{fr})h + \frac{m}{2}v^2 = (826(9.8) + 244)36 + \frac{826}{2}7^2 = 320000 \text{ J}$$

ii)

$$T = (mg + F_{fr}) + ma$$

$$a = \frac{v^2}{2h}$$

$$T = (mg + F_{fr}) + m \frac{v^2}{2h} = (826(9.8) + 244) + \frac{826}{2(36)}7^2 = 8900 \text{ N}$$

iii)

$$P = T \frac{v}{2} = \left((826(9.8) + 244) + \frac{826}{2(36)}7^2 \right) \frac{7}{2} = 31000 \text{ W.}$$

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