



PROBLEM 14.40

A 40-lb block B is suspended from a 6-ft cord attached to a 60-lb cart A , which may roll freely on a frictionless, horizontal track. If the system is released from rest in the position shown, determine the velocities of A and B as B passes directly under A .

SOLUTION

Conservation of linear momentum:

Since block and cart are initially at rest,

$$\mathbf{L}_0 = 0$$

Thus, as B passes under A ,

$$\mathbf{L} = m_A \mathbf{v}_A + m_B \mathbf{v}_B = 0$$

$$\rightarrow +, m_A v_A + m_B v_B = 0$$

$$v_A = -\frac{m_B}{m_A} v_B$$



Conservation of energy:

Initially,

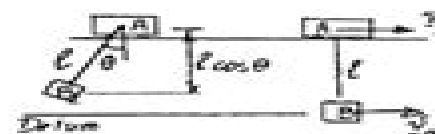
$$T_0 = 0$$

$$V_0 = m_B g l (1 - \cos \theta)$$

As B passes under A ,

$$T = \frac{1}{2} m_A v_A^2 + \frac{1}{2} m_B v_B^2$$

$$V = 0$$



Thus,

$$T_0 + V_0 = T + V: m_B g l (1 - \cos \theta) = \frac{1}{2} m_A v_A^2 + \frac{1}{2} m_B v_B^2$$

Substituting for v_A from (1) and multiplying by 2:

$$\begin{aligned} 2m_B g l (1 - \cos \theta) &= m_A \left(\frac{m_B^2}{m_A^2} v_B^2 \right) + m_B v_B^2 \\ &= \left(\frac{m_B^2}{m_A} + m_B \right) v_B^2 = m_B \frac{m_B + m_A}{m_A} v_B^2 \\ v_B &= \sqrt{\frac{2m_A}{m_A + m_B} g l (1 - \cos \theta)} \end{aligned} \quad (2)$$

Vector Mechanics Solution Manual 9th

Arthur James Wells



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Dynamics – Formulas and Problems Dietmar Gross, Wolfgang Ehlers, Peter Wriggers, Jörg Schröder, Ralf Müller, 2016-10-05 This book contains the most important formulas and more than 190 completely solved problems from Kinetics and Hydrodynamics It provides engineering students material to improve their skills and helps to gain experience in solving engineering problems Particular emphasis is placed on finding the solution path and formulating the basic equations Topics include Kinematics of a Point Kinetics of a Point Mass Dynamics of a System of Point Masses Kinematics of Rigid Bodies Kinetics of Rigid Bodies Impact Vibrations Non Inertial Reference Frames Hydrodynamics *Canadiana* ,1982

Scientific and Technical Books in Print ,1972

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Subject Guide to Books in Print ,1984

Aircraft Performance Mohammad H. Sadraey, 2017-01-27 Aircraft

Performance An Engineering Approach introduces flight performance analysis techniques that enable readers to determine performance and flight capabilities of aircraft Flight performance analysis for prop driven and jet aircraft is explored supported by examples and illustrations many in full color MATLAB programming for performance analysis is included and coverage of modern aircraft types is emphasized The text builds a strong foundation for advanced coursework in aircraft design and performance analysis **Scientific and Technical Aerospace Reports** ,1990 *The British National*

Bibliography Arthur James Wells, 1998

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Computational Fluid and Solid Mechanics

2003 K.J Bathe, 2003-06-02 Bringing together the world s leading researchers and practitioners of computational mechanics these new volumes meet and build on the eight key challenges for research and development in computational mechanics Researchers have recently identified eight critical research tasks facing the field of computational mechanics These tasks have come about because it appears possible to reach a new level of mathematical modelling and numerical solution that will lead to a much deeper understanding of nature and to great improvements in engineering design The eight tasks are The automatic solution of mathematical models Effective numerical schemes for fluid flows The development of an effective mesh free numerical solution method The development of numerical procedures for multiphysics problems The development of numerical procedures for multiscale problems The modelling of uncertainties The analysis of complete life cycles of systems Education teaching sound engineering and scientific judgement Readers of Computational Fluid and Solid Mechanics 2003 will be able to apply the combined experience of many of the world s leading researchers to their own research needs Those in academic environments will gain a better insight into the needs and constraints of the industries they are involved with those in industry will gain a competitive advantage by gaining insight into the cutting edge research being carried out by colleagues in academia Features Bridges the gap between academic researchers and practitioners in industry Outlines the eight main challenges facing Research and Design in Computational mechanics and offers new insights into the shifting the research agenda Provides a vision of how strong basic and exciting education at university can be harmonized with life long

learning to obtain maximum value from the new powerful tools of analysis

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