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FOUNDATIONS OF ENGINEERING

Series Editor: G. E. Drabble

Dynamics

G. E. Drabble

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First published 1990

Published by
MACMILLAN EDUCATION LTD
Houndmills, Basingstoke, Hampshire RG21 2XS
and London
Companies and representatives
through the world

Typeset by P & R Typesetters Ltd, Salisbury, Wiltshire, UK

British Library Cataloguing in Publication Data

Drabble, George E. (George Edmund), 1924 -

Dynamics.

I. Dynamics

I. Title II. Series

531'.11

ISBN 978-0-333-47379-5

ISBN 978-1-349-10448-2 (eBook)

DOI 10.1007/978-1-349-10448-2

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CONTENTS

<i>Series Editor's Foreword</i>	vii
<i>How to use this book</i>	ix
Programme	
1 Revision	1
2 Kinematics of Mechanisms: Velocity Diagrams	67
3 Kinematics of Mechanisms: Acceleration Diagrams	93
4 Kinematics of Mechanisms: Analysis	121
5 Non-linear Acceleration	147
6 Dynamics of Rigid Bodies	183
7 Work, Energy and Power	221
8 Momentum	257
9 Coupled and Geared Systems	295
10 Simple Vibration	339
<i>Index</i>	369

SERIES EDITOR'S FOREWORD

This series of programmed texts has been written specifically for first year students on degree courses in engineering. Each book covers one of the core subjects required by electrical, mechanical, civil or general engineering students, and the contents have been designed to match the first year requirements of most universities and polytechnics.

The layout of the texts is based on that of the well-known text, *Engineering Mathematics* by K. Stroud (first published by Macmillan in 1970, and now in its third edition). The remarkable success of this book owes much to the skill of its author, but it also shows that students greatly appreciate a book which aims primarily to help them to learn their chosen subjects at their own pace. The authors of this present series acknowledge their debt to Mr Stroud, and hope that by adapting his style and methods to their own subjects they have produced equally helpful and popular texts.

Before publication of each text the comments of a class of first year students, of some recent engineering graduates and of some lecturers in the field have been obtained. These helped to identify any points which were particularly difficult or obscure to the average reader or which were technically inaccurate or misleading. Subsequent revisions have eliminated the difficulties which were highlighted at this stage, but it is likely that, despite these efforts, a few may have passed unnoticed. For this the authors and publishers apologise, and would welcome criticisms and suggestions from readers.

Readers should bear in mind that mastering any engineering subject requires considerable effort. The aim of these texts is to present the material as simply as possible and in a way which enables students to learn at their own pace, to gain confidence and to check their understanding. The responsibility for learning is, however, still very much their own.

G.E. Drabble

HOW TO USE THIS BOOK

This book is one of a series which has been designed to help you in learning the basic subjects of a first-year course in Engineering. You may have seen similar texts before, but if not, then you need to understand that they are all written in short sections, called frames. Each frame normally contains just one or two facts that you need to understand or to apply, before going further. So the texts are designed to be read one frame at a time, in order, without skipping. Frequently, a frame will finish with a question, or a short exercise, to test that you have understood the work up to that point. You should always attempt the appropriate response to such endings: answer the question asked; undertake the exercise; write down your version of the formula or theory asked for, and so on. When your response is incorrect, find out why as soon as you can, either by re-reading the previous work, or by getting help from someone else. If you cannot do this immediately, make a note, and do so as soon as you have the opportunity.

A note on accuracy. The margin of error of most engineering calculations is of the order of 1%, and some calculations may have a margin of error nearer to 5%. One reason for this is that the data available are often not known to greater accuracy, and it is impossible for the accuracy of a calculation to be higher than that of the data used. Normally, three-figure accuracy is sufficient for most engineering calculations. But the purpose of this text is to help you to learn engineering theory. If, in the text, a wheel reaction force on a car is given as 2127.5 N, this does not mean that the answer is accurate to that extent. But if you check the calculations yourself (as you should frequently do), you will know you are doing them correctly if you arrive at the same answer. Of course, you cannot always expect to reach exactly the same answer; the order in which the operations are performed, and even the make of calculator, may result in small variations.