

Chapter - 1

Force and moment (Resultant and Equilibrium)

Engineering mechanics \Rightarrow It is the branch of physical science which deals with the state of a body under the action of external agency.

State $\begin{cases} \rightarrow \text{state of rest} \\ \rightarrow \text{state of motion} \end{cases}$

External agency $\begin{cases} \rightarrow \text{Force} \\ \rightarrow \text{moment} \end{cases}$

Force \Rightarrow Force is an action of an external agency which changes or tries to change the state of a body. (Unit = Newton; Push/Pull)

Moment \Rightarrow It is a measure of turning effect.
 Unit = Nm
 moment = Force \times distance

moment about O = $F \times d$



Quantity \Rightarrow Anything which can be measured directly or indirectly.

- i) Scalar (mag)
- ii) vector (mag - dir)

Rigid body \Rightarrow When there is no deformation in the body after the application of external force, the body is said to be rigid. \Rightarrow Deformation is very negligible, so neglected. \Rightarrow No body is perfectly rigid.

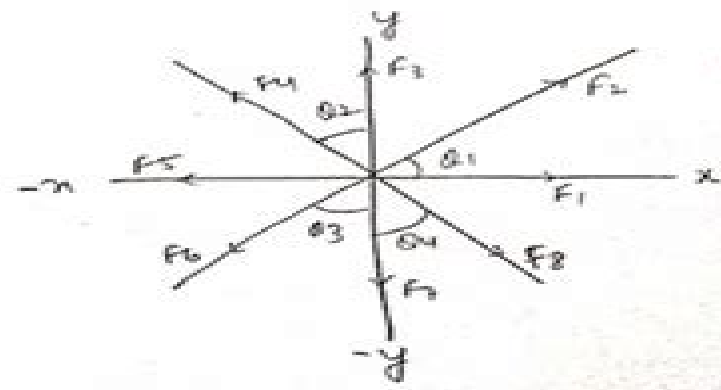
Resolution of force \Rightarrow



Composition of forces \Rightarrow

$\Sigma F_x =$ Horizontal $= F_1 + F_2 \cos \theta_1 - F_4 \sin \theta_2 - F_5 - F_6 \sin \theta_3 + F_8 \sin \theta_4$

$\Sigma F_y =$ Vertical $= F_2 \sin \theta_1 + F_3 + F_4 \cos \theta_2 - F_6 \cos \theta_3 - F_7 - F_8 \cos \theta_4$



Basic Mechanical Engineering Notes Calicut University

R Barnett



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Current Advances in Mechanical Engineering Saroj Kumar Acharya, Dipti Prasad Mishra, 2021-03-18 This book presents select proceedings of the International Conference on Recent Advances in Mechanical Engineering Research and Development ICRAMERD 2020 The contents focus on latest research and current problems in various branches of mechanical engineering Some of the topics discussed here include fracture and failure analysis fuels and alternative fuels combustion and IC engines advanced manufacturing technologies powder metallurgy and rapid prototyping industrial engineering and automation supply chain management design of mechanical systems vibrations and control engineering automobile engineering fluid mechanics and machines heat transfer composite materials micro and nano engineering for energy storage and conversion and modeling and simulations The wide range of topics presented in this book can make it useful for beginners researchers as well as professionals in mechanical engineering **Advances in Production and**

Industrial Engineering P. M. Pandey, Pradeep Kumar, Vikas Sharma, 2020-09-20 This book comprises the select proceedings of the International Conference on Emerging Trends in Mechanical and Industrial Engineering ICETMIE 2019 The conference covers current trends in thermal design industrial production and other sub disciplines of mechanical engineering This volume focuses on different industrial and production engineering areas such as additive manufacturing rapid prototyping computer aided engineering advanced manufacturing processes manufacturing management and automation sustainable manufacturing systems metrology manufacturing process optimization operations research and decision making models production planning and inventory control supply chain management and quality engineering The contents of this book will be useful for students researchers and other professionals interested in industrial and production engineering

Proceedings of Fluid Mechanics and Fluid Power (FMFP) 2023, Vol. 4 Hardik Kothadia, Rajneesh Bhardwaj, Jaywant H. Arakeri, 2025-03-26 This book presents select proceedings of the 10th International and 50th National Conference on Fluid Mechanics and Fluid Power It covers recent research developments in the area of fluid mechanics measurement techniques in fluid flows computational fluid dynamics The key research topics discussed in this book are fundamental studies in flow instability and transition fluid structure interaction multiphase flows solidification melting cavitation porous media flows bubble and droplet dynamics bio mems micro scale experimental techniques flow control devices underwater vehicles bluff body bio fluid mechanics aerodynamics turbomachinery propulsion and power heat transfer and thermal engineering fluids engineering advances in aerospace and defense technology micro and nano systems engineering acoustics structures and fluids advanced theory and simulations novel experimental techniques in thermofluids engineering and many more The book is a valuable reference for researchers and professionals interested in thermo fluids engineering Intelligent

Manufacturing Systems in Industry 4.0 B. B. V. L. Deepak, M. V. A. Raju Bahubalendruni, D. R. K. Parhi, B. B. Biswal, 2023-06-30 This book presents the select proceedings of the 4th International Conference on Innovative Product

Design and Intelligent Manufacturing System IPDIMS 2022 It covers the latest trends in the areas of design and manufacturing The main topics covered include Industry 4.0 smart manufacturing advanced robotics and CAD CAM CIM The contents of this book are useful for researchers and professionals working in the disciplines of mechatronics mechanical manufacturing production and industrial engineering *Proceedings of the 1st International Conference on Fluid, Thermal and Energy Systems* Sudev Das, Narasimha Mangadoddy, Jaap Hoffmann, 2024-01-17 This book comprises the proceedings of the 1st International Conference on Fluid Thermal and Energy Systems The contents of this book focus on phase change heat transfer advanced energy systems separated flows turbulence and multi phase modeling computational fluid flow and heat transfer thermal energy storage systems integrated energy systems nuclear thermal hydraulics heat transfer in nanofluids etc This book serves as a useful reference to researchers academicians and students interested in the broad field of thermo fluid science and engineering **Indian Engineering**, 1918 **Engineering**, 1926 **Indian Engineering** Patrick Doyle, 1902 **Journal of Scientific and Industrial Research**, 1945 *Comprehensive Basic Mechanical Engineering* R.K. Rajput, 2005 *The Indian and Eastern Engineer*, 1920 *Basic Mechanical Engineering* Rajput, 2002 **Metals and Materials**, 1988 *The Engineer*, 1898 *Scientific American*, 1899 **Careers Digest**, 1977 *Basic Mechanical Engineering (For HPTU, Hamirpur)* Singh Sadhu, This book Basic Mechanical Engineering now in its second edition continues to provide all essential features of the first edition i.e. it contains nine chapters in all and provides a large number of solved and unsolved problems and exercises In this edition new topics such as Ideal Gas Laws Characteristic Gas Equation Avogadro's Hypothesis Joule's Law **Basic Mechanical Engineering** Pravin Kumar, Basic Mechanical Engineering covers a wide range of topics and engineering concepts that are required to be learnt as in any undergraduate engineering course Divided into three parts this book lays emphasis on explaining the logic and physics of critical problems to develop analytical skills in students **Recent Advances in Industrial Production** Rajeev Agrawal, Jinesh Kumar Jain, Vinod Singh Yadav, Vijaya Kumar Manupati, Leonilde Varela, 2021-11-02 This book presents the select proceedings of the International Conference on Evolution in Manufacturing ICEM 2020 and examines a range of areas including evolution in manufacturing intelligent networks bio inspired models and algorithms internet of things and cyber manufacturing This book intends to provide a contribution to the domain of collaborative and intelligent networks and systems to fill the gap in theories and practical applications through suitable methods and solutions applicable to a wide range of instances Various topics covered include broad range of research challenges in the fields of artificial intelligence and addressing current and future trends in industry 4.0 oriented scenario data analytics and big data operation and manufacturing management The book will be a valuable reference for beginners researchers and professionals interested in artificial intelligence in engineering and production management and allied fields *Recent Advances in Manufacturing, Automation, Design and Energy Technologies* Sendhil Kumar Natarajan, Rajiv Prakash, K. Sankaranarayanan, 2021-10-11 This book comprises the

proceedings of the 1st International Conference on Future Technologies in Manufacturing Automation Design and Energy 2020 The contents of this volume focus on recent technological advances in the field of manufacturing automation design and energy Some of the topics covered include additive manufacturing renewable energy resources design automation process automation and monitoring etc This volume will prove a valuable resource for those in academia and industry

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