

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



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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

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