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GH S 41

Statics & Dynamics

(Number of Teaching hours: 80; Time:3 hrs; Marks: 100)

(To answer five questions, choosing one out of two questions from each unit)

UNIT I: Composition and resolution of forces; parallelogram of forces, Components and resolved parts, Coplanar forces: Equilibrium of concurrent forces, Triangle of forces, Lami's Theorem and its converse. Parallel forces. Moment of a force ; Definition, geometrical representation of Moments, Varignon's Theorem. Couples ;definition, equilibrium of Couples, Equivalence of two Couples, Resultant of Couples, Resultant of a couple and a force.

UNIT II: Reduction of coplanar forces, equilibrium of coplanar forces. Friction: laws of statical friction, laws of limiting friction, solution of problems on equilibrium of heavy bodies (such as uniform rods) resting on plane surfaces.
Centre of gravity: c.g of thin uniform rod, uniform lamina, triangular lamina and lamina in the form of a parallelogram and trapezium.

UNIT III: Rectilinear motion with variable Laws of forces; Force of repulsion varying as displacement, Motion under inverse square Law, Motion of a particle attracted towards the centre of the Earth. Motion under other laws of forces, simple harmonic motion; velocity and acceleration , Amplitude, Time-period. Collision of elastic bodies; direct and oblique impact, Loss of Energy due to collision, impulsive action between colliding spheres .

UNIT IV: Projectiles; Horizontal Range , Time of flight, Greatest height , position and velocity at any time, path of a projectile is a parabola.
Rectilinear motion in resisting media on a horizontal plane where resistance varies as (i) velocity, (ii) square of velocity, (iii) displacement; vertical motion under gravity where resistance varies as (i) velocity, (ii) square of velocity.

UNIT V: Tangential and normal acceleration on smooth curves, radial & transversal acceleration, motion on a smooth plane curve such as vertical circles and cycloids.
Impulse and Impulsive force, conservation of linear momemtum. Work done by a force; work energy equation; potential function; conservative forces.

BOOKS

Text Books:

1. Gupta, P. K., and Juneja, R. : Dynamics, Ramesh Book Depot, Jaipur, 2003 Edition.
2. Ray, M. : A Text Book on Dynamics for B.A./B.Sc. students, S. Chand Publication, Delhi, 2002 Edition.
3. Singh, K. K. : Text Book of Dynamics, PHI Learning pvt. Ltd., New Delhi, 2011 Edition.
4. Das B.C. and Mukharjee B.N., Dynamics UN Dhar and Sons Publisher, 2002 Edition.
5. Das, B. C. and Mukherjee, B. N.: Statics, U. N. Dhar & Sons Publications, Kolkata, 2002 Edition.
6. Loney, S. L.: An elementary treatise on the Dynamics of a particle and of rigid bodies, Rahda publishing House, Kolkata, 2000 Edition.

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Reference Books

1. Varma, R. S.: Statics, Pothishala, Allahabad, 2001 Edition.
2. Loney, S. L.: An elementary treatise on Statics, Rahda publishing House, Kolkata, 2000 Edition.
3. Singh, K. K. : Text Book of Dynamics, PHI Learning pvt. Ltd., New Delhi, 2011.