Engineering Mechanics Theory - Question Bank

Module 1 – System of Forces

Module Section 1.1 – System of Coplanar Forces

Class: F.Y. B. Tech   Division: C4

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References: Engineering Mechanics, by M. D. Dayal & Engineering Mechanics – Statics and Dynamics, by N. H. Dubey.

Module 1 – System of Forces

Module 1.1 Coplanar forces

1. State and prove Varignon's theorem   Marks 2 to 5
2. State and explain varignon's theorem with suitable example.
                                                                                  Marks 2
3. List the different types of system of forces and explain any one of them.   Marks 2
4. Discuss on different types of load with neat sketches. Marks 5
5. Explain principle of transmissibility of forces with a neat sketch
6. Explain law of parallelogram of forces.
7. The resultant of a system of parallel of forces is zero. What does it signify?

Module 1.2 Forces in Space

1. Discuss resultant of concurrent forces in space   Marks 4

Module 2 – Kinematics of particles and Rigid bodies

Module 2.1 Kinematics of particles

1. Explain x-t, v-t and a-t curves in kinematics.   Marks 5/6
2. Explain i) curvilinear motion by rectangular component method. Ii) curvilinear motion by tangential and normal component method.

Module 2.2: Kinematics of Rigid bodies

1. Define general plane motion & ICR. What are the properties of an ICR.   Marks 5
2. Classify types of motion for rigid body using suitable example.   Marks 5
3. Explain Instantaneous centre of rotation.   Marks 5/6

Module 3: Centroid

1. Describe the method of finding centroids of composite areas.

Module 4 – Equilibrium of Force System & Friction

Module 4.1 Equilibrium of Force System

1. State Lami's theorem. State the necessary condition for application of Lami's theorem.   Marks 5
2. State and prove Lami's theorem.   Marks 5
3. Describe types of supports used for beams.   Marks 2
4. Discuss on different types of supports with neat sketches. Marks 5
5. What are the conditions of equilibrium for concurrent, parallel & general force system?
6. Describe F.B.D. and its importance in the analysis of problems.

Module 4.2 Friction:

1. Define laws of friction or State laws of dry friction. Marks 5
2. Discuss laws of friction.   Marks 5
3. Describe angle of friction and cone of friction of with neat sketches.   Marks 5
4. Define angle of friction and angle of repose. Show that angle of angle of fraction is equal to angle of repose. Marks 4
5. Explain angle of friction, angle of repose and the relation between the two.   Marks 4
6. Why coefficient of static friction is greater than coefficient of kinetic friction?

Module 5 – Kinetics of particle

Module 5.1: Force and acceleration
1. Explain D'Alembert's Principle   Marks 2

Module 5.2: Work energy principle
1. State and derive work energy principle   Marks 5
2. Explain work energy principle for a particle   Marks 2
3. Explain work energy principle and write its mathematical expression.   Marks 5
4. Explain the concept of work of spring. Also explain when it will be positive and when it will be negative.   Marks 2
5. Explain: a) work done by a force
   b) Work done by a weight force
   c) Work done by a frictional force
   d) Work done by a spring force

Module 5.3: Impulse Momentum Principle

1. Derive an equation for law of conservation of momentum.

   Marks 2
2. Describe elastic and inelastic collision   Marks 5
3. Discuss on direct central and oblique central impact with
   neat sketches.   Marks 5
4. Define the terms neat sketches: direct impact, oblique
   impact and line of impact.   Marks 6
5. State and derive the impulse momentum principle.
6. State the principle of conservation of momentum.