

### Junior Engineer (JE) Practice Set: Engineering Mechanics - Intro & Units

1. Which branch of Engineering Mechanics deals with the forces and their effects while acting upon bodies in motion, without considering the reference of the force causing that motion?

- A) Statics
- B) Kinetics
- C) Kinematics
- D) Dynamics

(Similar to: SSC JE 2017)

2. A body is defined as a 'Rigid Body' in Engineering Mechanics if:

- A) It undergoes very small deformation
- B) It does not undergo any deformation under external forces
- C) It has a high Young's Modulus
- D) It can resist only compressive forces

(Similar to: RRB JE 2015)

3. Which of the following is classified as a 'Fundamental Physical Quantity'?

- A) Velocity
- B) Force
- C) Pressure
- D) Time

(Similar to: State PSC JE 2019)

4. A Physical Quantity that possesses only magnitude and no specific direction is known as:

- A) Scalar Quantity
- B) Vector Quantity
- C) Tensor Quantity
- D) Derived Quantity

(Similar to: SSC JE 2014)

5. Stress is categorized as which order of Tensor?

- A) Zero Order Tensor
- B) First Order Tensor
- C) Second Order Tensor
- D) Third Order Tensor

(Similar to: ESE/State PSC 2020)

6. The study of the state of a rigid body under the application of external forces is known as:

- 1) Engineering Mechanics
- B) Thermodynamics
- C) Fluid Mechanics
- D) Kinematics

(Similar to: RRB JE 2019)

7. Which of the following is an example of a Vector quantity?

- A) Mass

- B) Density
- C) Momentum
- D) Volume

(Similar to: SSC JE 2018)

8. Dynamics is further bifurcated into:

- A) Statics and Kinetics
- B) Kinematics and Statics
- C) Kinetics and Kinematics
- D) Scalar and Vector

(Similar to: State PSC JE 2021)

9. According to the provided notes, a 'First Order Tensor' consists of:

- A) Magnitude + Zero Direction
- B) Magnitude + 1-Direction
- C) Magnitude + 2-Directions
- D) Direction only

(Similar to: Central Exams JE 2016)

10. Displacement is a \_\_\_\_\_ quantity, whereas Distance is a \_\_\_\_\_ quantity.

- A) Scalar, Vector
- B) Vector, Scalar
- C) Vector, Vector
- D) Scalar, Scalar

(Similar to: SSC JE 2015)

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#### ### Answer Key

- 1. C
- 2. B
- 3. D
- 4. A
- 5. C
- 6. A
- 7. C
- 8. C
- 9. B
- 10. B

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#### ### Conceptual Logic & Explanations

1. Answer (C): Kinematics is the branch of Dynamics that deals with the motion of bodies without considering the forces (the cause) that produce the motion. Kinetics, conversely, does consider the forces.

2. Answer (B): In the context of Engineering Mechanics, a rigid body is an idealization where the distance between any two points on the body remains constant regardless of the external force applied (no deformation).
3. Answer (D): Fundamental quantities are independent (Mass, Length, Time). Quantities like Velocity and Force are "Derived" because they are combinations of fundamental ones (e.g., Velocity = Length/Time).
4. Answer (A): Scalar quantities are defined entirely by magnitude (e.g., 5 kg mass). Vector quantities require both magnitude and direction.
5. Answer (C): Stress ( $\sigma_{xy}$ ) is a second-order tensor because it requires magnitude and two directions (the plane and the direction of force) to be fully defined.
6. Answer (A): Mechanics is specifically the branch of physics dealing with the behavior of rigid bodies under force.
7. Answer (C): Momentum is the product of mass (scalar) and velocity (vector), making it a vector quantity. Mass, Density, and Volume have no direction.
8. Answer (C): Dynamics (bodies in motion) is split into Kinetics (considers forces) and Kinematics (ignores forces).
9. Answer (B): A zero-order tensor is a scalar (no direction). A first-order tensor is a vector (one direction).
10. Answer (B): Displacement is the shortest path between two points in a specific direction (Vector), while Distance is the total path length covered (Scalar).