Engineering Mechanics

1. The acceleration of a body is defined as:

(A) Rate of change of displacement

(B) Rate of change of velocity

(C) Rate of change of energy

(D) Rate of change of mass

Answer: B) Rate of change of velocity

2. The units of moment of force are:

(A) N

(B) N/m

(C) Nm

(D) N/m^2

Answer: C) Nm

3. Lami's theorem is applicable for:

(A) Three coplanar forces

(B) Three non-coplanar forces

(C) Two forces

(D) Four forces

Answer: A) Three coplanar forces

4. The centroid of a semicircular area lies at a distance from the base equal to:

(A) r/2

(B) $4r/3\pi$

(C) r/π

(D) 3r/4

Answer: B) $4r/3\pi$

5. The law of polygon of forces is used to find:

(A) Resultant of two forces

(B) Resultant of concurrent forces

(C) Resultant of parallel forces

(D) Resultant of coplanar forces

Answer: B) Resultant of concurrent forces

6. The moment of inertia of a thin rod about its centroidal axis is:

(A) $ml^2/3$

(B) $ml^2/12$ (C) $ml^2/36$

(D) $ml^2/9$

Answer: B) $ml^2/12$

7. In a truss, a member is a zero-force member if:

(A) Both ends are pinned

(B) It does not carry any load

(C) The load is axial

(D) It forms a triangle

Answer: B) It does not carry any load

8. Which one is NOT a vector quantity?

(A) Displacement

(B) Velocity

(C) Force

(D) Distance

Answer: D) Distance

9. The units of energy are:

(A) Nm

(B) J

(C) W

(D) kg-m

Answer: B) J

10. The principle of superposition applies to:

(A) Nonlinear systems

(B) Linear systems

(C) All systems

(D) Dynamic systems

Answer: B) Linear systems

11. If a force of 10 N acts at a distance of 2 m from a point, the moment about that point is:

(A) 5 Nm

(B) 10 Nm (C) 20 Nm

(D) 2 Nm

Answer: C) 20 Nm

12. When a body moves in a straight line with uniform speed, its acceleration is:

(A) zero

(B) maximum

(C) minimum

(D) constant

Answer: A) zero

13. Varignon's theorem is concerned with:

(A) Work

(B) Energy

(C) Moments

(D) Velocity

Answer: C) Moments

14. If a body returns to its original position after a force is removed, it is said to be:

(A) rigid

(B) elastic (C) plastic

(D) brittle

Answer: B) elastic

15. The slope of a velocity-time graph represents:

(A) distance

(B) speed

(C) acceleration

(D) time

Answer: C) acceleration

16. Parallelogram law of forces is used to calculate:

(A) Difference of two forces

(B) Product of two forces

(C) Resultant of two forces

(D) Resolution of two forces

Answer: C) Resultant of two forces

17. The mass per unit volume is called:

(A) Pressure

(B) Density

(C) Weight

(D) Specific gravity

Answer: B) Density

18. At a hinge support, reaction has:

(A) One component

(B) Two components

(C) Three components

(D) No component

Answer: B) Two components

19. The region below the neutral axis in a cantilever is subjected to:

(A) tension

(B) compression

(C) shear

(D) torsion

Answer: A) tension

20. The time rate of change of angular velocity is:

(A) angular velocity

(B) angular acceleration

(C) linear acceleration (D) moment of inertia

Answer: B) angular acceleration

21. When two bodies are connected by a string over a smooth pulley, it is called:

(A) Link

(B) Pulley System

(C) Atwood Machine

(D) Tension System

Answer: C) Atwood Machine

22. The dimensions of force are:

(A) MLT

(B) ML^2T^{-2}

(C) MLT^{-2}

(D) MT^{-2}

Answer: C) MLT^{-2}

23. The work done by a force is zero if:

(A) Displacement is perpendicular to force

(B) Displacement is zero

(C) Force is zero

(D) All of the above

Answer: D) All of the above

24. A rigid body rotates about a fixed axis. All particles of the body have:

(A) Same linear velocity

(B) Same angular velocity

(C) Same acceleration

(D) Same momentum

Answer: B) Same angular velocity

25. The resultant of two forces can be MAXIMUM when they are at:

(A) 0°

(B) 90°

(C) 120°

(D) 180°

Answer: A) 0°

26. The moment of inertia of a circular disc about its diameter is:

(A) MR^2

(B) $MR^2/2$ (C) $MR^2/4$

(D) $MR^2/8$

Answer: C) $MR^2/4$

27. The property of a material by virtue of which it can be drawn into thin wires is: (A) Malleability

(B) Ductility

(C) Elasticity

(D) Toughness

Answer: B) Ductility

28. The resolution of a force means:

(A) Splitting into two components

(B) Summing with another force

(C) Changing direction

(D) Doubling its value

Answer: A) Splitting into two components

29. The velocity ratio of an inclined plane is:

(A) $1/\sin\theta$

(B) $\sin\theta$

(C) $\cos\theta$

(D) $\tan\theta$

Answer: A) $1/\sin\theta$

30. Newton's third law is:

(A) Law of inertia

(B) For every action there is an equal and opposite reaction

(C) F = ma

(D) Work-energy theorem

Answer: B) For every action there is an equal and opposite reaction

31. The value of the coefficient of restitution for a perfectly elastic collision is:

(A) 0

(B) 0.5

(C) 1

(D) Infinity

Answer: C) 1

32. The unit of angular velocity is:

(A) m/s

(B) rad/s

(C) deg/s

(D) N·m

Answer: B) rad/s

33. When a body slides on an inclined plane, the friction acting is:

(A) Rolling friction

(B) Static friction

(C) Sliding friction

(D) Dynamic friction

Answer: C) Sliding friction

34. A couple produces:

(A) Translatory motion

(B) Rotational motion

(C) Both motions

(D) No motion

Answer: B) Rotational motion

35. For a body in equilibrium under three forces, they must be:

(A) Non-concurrent

(B) Parallel

(C) Coplanar and concurrent

(D) Coplanar and parallel

Answer: C) Coplanar and concurrent

36. The magnitude of the resultant vector of two equal vectors with an angle θ between them is:

(A) $2A \cos(\theta/2)$

(B) $2A \sin(\theta/2)$

(C) $2A \cos\theta$

(D) $2A \sin\theta$

Answer: A) $2A \cos(\theta/2)$

37. The unit of work is:

(A) Joule

(B) Newton

(C) Watt

(D) Pascal

Answer: A) Joule

38. The property of a material by which it regains its original shape after removing the external force is:

(A) Plasticity

(B) Elasticity

(C) Ductility

(D) Malleability

Answer: B) Elasticity

39. Frictional force always opposes:

(A) Applied force

(B) Motion

(C) Acceleration

(D) Reaction force

Answer: B) Motion

40. The moment of a couple is measured by:

(A) Product of force and its arm

(B) Product of force and distance

(C) Force only

(D) Arm only

Answer: A) Product of force and its arm

41. A polygon representing forces in equilibrium must:

(A) Close

(B) Not close

(C) Be a parallelogram

(D) Be a triangle

Answer: A) Close

42. The absolute unit of force is:

(A) Dyne

(B) Newton

(C) Pound

(D) Joule

Answer: B) Newton

43. The force required to move a body up an inclined plane is least if the body is:

(A) Smooth

(B) Frictionless

(C) Has maximum friction

(D) Has minimum friction

Answer: B) Frictionless

44. In projectile motion, the range is maximum when the angle of projection is:

(A) 0°

(B) 45° (C) 90°

(D) 60°

Answer: B) 45°

45. The instantaneous center of rotation for a rolling wheel is located:

(A) At the center

(B) At the top

(C) At the point of contact with ground

(D) At infinity

Answer: C) At the point of contact with ground

46. The SI unit of pressure is:

(A) N/m

(B) N/m^2

(C) kg/m^2

(D) Pa/s

Answer: B) N/m^2

47. A body in uniform circular motion has:

(A) Constant speed

(B) Constant velocity

(C) Constant acceleration

(D) Constant angular displacement

Answer: A) Constant speed

48. In a system of pulleys, mechanical advantage increases by:

(A) Reducing friction

(B) Increasing number of pulleys

(C) Reducing weight (D) Increasing effort

Answer: B) Increasing number of pulleys

49. The mechanical advantage of a machine is the ratio of:

(A) Load to effort

(B) Effort to load

(C) Distance moved by effort to load

(D) Force to velocity

Answer: A) Load to effort

50. The condition for static equilibrium is:

(A) $\Sigma F = 0$

(B) $\Sigma M = 0$

(C) Both A and B

(D) None of these

Answer: C) Both A and B

51. The property by which a body resists change in its state is:

(A) Inertia

(B) Momentum

(C) Mass

(D) Acceleration

Answer: A) Inertia

52. Resolution of a force refers to:

(A) Separating into components

(B) Finding resultant

(C) Balancing force

(D) Increasing force

Answer: A) Separating into components

53. The mass of a body is measured in:

(A) Kilogram

(B) Newton

(C) Dyne

(D) Pascal

Answer: A) Kilogram

54. The distance travelled by a particle in one cycle of circular motion is:

(A) $2\pi r$

(B) πr

(C) r

(D) πr^2

Answer: A) $2\pi r$

55. The slope of force vs. displacement graph represents:

(A) Acceleration

(B) Work

(C) Energy

(D) Stiffness

Answer: D) Stiffness

56. In simple harmonic motion, acceleration of the particle is:

(A) Constant

(B) Zero

(C) Proportional to displacement

(D) Proportional to velocity

Answer: C) Proportional to displacement

57. The net force acting on a body moving with constant velocity is:

(A) Maximum

(B) Minimum

(C) Zero

(D) Infinite

Answer: C) Zero

58. Centroid of a triangle lies at a height from its base equal to:

(A) h/2

(B) h/3

(C) 2h/3

(D) h

Answer: B) h/3

59. The principle of transmissibility is applicable to:

(A) Forces

(B) Moments

(C) Energy

(D) Velocity

Answer: A) Forces

60. To lift maximum weight using a lever, the effort should be applied:

(A) Closest to fulcrum

(B) At any point

(C) Farther from fulcrum

(D) On the load

Answer: C) Farther from fulcrum

61. The time taken to complete one revolution in uniform circular motion is called:

(A) Frequency

(B) Period

(C) Amplitude

(D) Cycle

Answer: B) Period

62. A rigid body has how many degrees of freedom in plane motion?

(A) 1

(B) 2

(C) 3

(D) 4

Answer: C) 3

63. The ratio of lateral strain to longitudinal strain is:

(A) Hooke’s constant

(B) Elastic constant

(C) Poisson’s ratio

(D) Young’s modulus

Answer: C) Poisson’s ratio

64. The units of power are:

(A) Joule

(B) Newton

(C) Watt

(D) Pascal

Answer: C) Watt

65. The friction force is maximum when motion is:

(A) About to start

(B) Starting

(C) In progress

(D) At rest

Answer: A) About to start

66. For a cantilever beam with point load at its free end, maximum bending moment is at:

(A) Free end

(B) Fixed end

(C) Centre

(D) Quarter span

Answer: B) Fixed end

67. The principle by which a force can be moved along its line of action without changing its effect is:

(A) Superposition

(B) Transmissibility

(C) Equilibrium

(D) Parallelogram

Answer: B) Transmissibility

68. The center of gravity of a uniform rod is at:

(A) Midpoint

(B) End point

(C) Quarter point

(D) Three-quarter point

Answer: A) Midpoint

69. The tendency of a force to rotate a body about an axis is called:

(A) Pressure

(B) Torque

(C) Energy

(D) Work

Answer: B) Torque

70. The moment of inertia for a rectangle of width b and height h about its centroidal axis is:

(A) $bh^3/12$

(B) $b^3h/12$

(C) $bh/12$

(D) $b^2h^2/12$

Answer: A) $bh^3/12$

71. Newton's second law states that:

(A) For every action there is equal and opposite reaction

(B) F = ma

(C) A body remains at rest or in uniform motion unless acted upon

(D) Energy is conserved

Answer: B) F = ma

72. What remains constant in a projectile motion (neglecting air resistance)?

(A) Speed

(B) Horizontal velocity

(C) Vertical velocity

(D) Both

Answer: B) Horizontal velocity

73. The total angular displacement during one revolution is:

(A) π rad

(B) 2π rad

(C) 180°

(D) 360°

Answer: B) 2π rad

74. If two parallel forces are equal and opposite, their resultant is:

(A) Zero

(B) Couple

(C) Equal to their sum

(D) Infinity

Answer: B) Couple

75. The direction of frictional force is always:

(A) Along the force

(B) Opposite to the direction of motion

(C) Perpendicular to applied force

(D) At an angle

Answer: B) Opposite to the direction of motion

76. The unit of modulus of elasticity is:

(A) N

(B) N/m

(C) N/m^2

(D) N·m

Answer: C) N/m^2

77. The centroid of a semicircle lies:

(A) At its center

(B) At the base

(C) Above base by $4r/3\pi$

(D) Below base by $r/2$

Answer: C) Above base by $4r/3\pi$

78. The ideal mechanical advantage of a machine is always:

(A) Less than 1

(B) Greater than 1

(C) Equal to 1

(D) None of these

Answer: B) Greater than 1

79. Motion that repeats itself after equal intervals of time is called:

(A) Random motion

(B) Oscillatory motion

(C) Linear motion

(D) Uniform motion

Answer: B) Oscillatory motion

80. A lever is said to be of second order when:

(A) Fulcrum is at one end (B)

Effort is in the middle

(C) Load is in the middle

(D) Both effort and load at ends

Answer: C) Load is in the middle

81. In projectile motion, maximum height is attained when vertical velocity becomes: (A)

Zero

(B) Maximum

(C) Minimum

(D) Equal to horizontal velocity

Answer: A) Zero

82. A force of 50 N is applied at an angle of 30° above the horizontal. The horizontal component is:

(A) 25 N

(B) 43.3 N

(C) 50 N

(D) 35 N

Answer: B) 43.3 N

83. The point where the resultant force acts on a body is called:

(A) The centroid

(B) Center of gravity

(C) Neutral axis

(D) Fulcrum

Answer: B) Center of gravity

84. The unit for angular acceleration is:

(A) rad/s

(B) rad/s²

(C) m/s²

(D) deg/s²

Answer: B) rad/s²

85. The process of finding resultant force by graphical method is called:

(A) Resolution

(B) Composition

(C) Superposition

(D) Vector addition

Answer: D) Vector addition

86. In a simply supported beam, the maximum bending moment under uniform load occurs at:

(A) Support

(B) Midspan

(C) Quarter span

(D) Anywhere

Answer: B) Midspan

87. Joule’s law relates to:

(A) Work

(B) Heat

(C) Current

(D) Power

Answer: B) Heat

88. The couple acting on a body has:

(A) Magnitude only

(B) Direction only

(C) Both magnitude and direction

(D) No magnitude

Answer: C) Both magnitude and direction

89. For uniform motion in a straight line, acceleration is:

(A) Positive

(B) Negative

(C) Zero

(D) Changing

Answer: C) Zero

90. The minimum force required to move a block up a 30° incline (friction ignored) is:

(A) mg

(B) mg sin30°

(C) mg cos30°

(D) mg/2

Answer: B) mg sin30°

91. A rigid body is one which:

(A) Can be deformed

(B) Resists deformation

(C) Changes volume under force

(D) Has infinite mass

Answer: B) Resists deformation

92. Work done by centripetal force in uniform circular motion is:

(A) Positive

(B) Zero

(C) Negative

(D) Maximum

Answer: B) Zero

93. The center of mass of a thin ring lies:

(A) At the center

(B) On the ring

(C) Outside the ring

(D) Varies with mass

Answer: A) At the center

94. The SI unit of momentum is:

(A) kg·m/s

(B) N·m

(C) kg/m²

(D) N·s

Answer: A) kg·m/s

95. The area under a force-displacement graph represents:

(A) Acceleration

(B) Work

(C) Power

(D) Momentum

Answer: B) Work

96. The property of a material by which it resists twisting is:

(A) Flexural strength

(B) Shear modulus

(C) Torsional rigidity

(D) Young’s modulus

Answer: C) Torsional rigidity

97. In static equilibrium, the algebraic sum of moments about any axis is:

(A) Maximum

(B) Minimum

(C) Zero

(D) Infinity

Answer: C) Zero

98. The moment of inertia depends on:

(A) Mass of the body

(B) Axis of rotation

(C) Distribution of mass

(D) All of the above

Answer: D) All of the above

99. A system is said to be conservative if:

(A) It conserves mass

(B) It conserves energy

(C) It is frictionless

(D) It has only forces acting

Answer: B) It conserves energy

100. Projectile motion is a combination of:

(A) Vertical and horizontal motions

(B) Circular and linear motions

(C) Translational and rotational motions

(D) Uniform and non-uniform motions

Answer: A) Vertical and horizontal motions

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