1. A framed structure, as shown in the below figure, is a

   ![Diagram of a framed structure]

   - (A) Perfect frame
   - (B) Deficient frame
   - (C) Redundant frame
   - (D) None of the above

   Correct Answer
   Answer: Option A

2. Lami’s theorem states that

   - (A) Three forces acting at a point will be in equilibrium
   - (B) Three forces acting at a point can be represented by a triangle, each side being proportional to force
   - (C) If three forces acting upon a particle are represented in magnitude and direction by the sides of a triangle, taken in order, they will be in equilibrium
   - (D) If three forces acting at a point are in equilibrium, each force is proportional to the sine of the angle between the other two

   Correct Answer
   Answer: Option D

3. Which is the correct statement about law of polygon of forces?

   - (A) If any number of forces acting at a point can be represented by the sides of a polygon taken in order, then the forces are in equilibrium
   - (B) If any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon, then the forces are in equilibrium
(C) If a polygon representing forces acting at a point is closed then forces are in equilibrium

(D) If any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon taken in order, then the forces are in equilibrium

Correct Answer
Answer: Option D

4. A flywheel on a motor goes from rest to 1000 rpm in 6 sec. The number of revolutions made is nearly equal to

(A) 25
(B) 50
(C) 100
(D) 250

Correct Answer
Answer: Option B

5. The forces, which meet at one point and their lines of action also lie on the same plane, are known as

(A) Coplanar concurrent forces
(B) Coplanar non-concurrent forces
(C) Non-coplanar concurrent forces
(D) Non-coplanar non-concurrent forces

Correct Answer
Answer: Option A

6. The bellow figure shows the three coplanar forces $P$, $Q$ and $R$ acting at a point $O$. If these forces are in equilibrium, then
(A) \( P/\sin \beta = Q/\sin \alpha = R/\sin \gamma \)
(B) \( P/\sin \alpha = Q/\sin \beta = R/\sin \gamma \)
(C) \( P/\sin \gamma = Q/\sin \alpha = R/\sin \beta \)
(D) \( P/\sin \alpha = Q/\sin \gamma = R/\sin \beta \)

Correct Answer
Answer: Option B

7. Forces are called coplanar when all of them acting on body lie in
(A) One point
(B) One plane
(C) Different planes
(D) Perpendicular planes

Correct Answer
Answer: Option B

8. Which of the following statement is correct?
(A) The algebraic sum of the forces, constituting the couple is zero
(B) The algebraic sum of the forces, constituting the couple, about any point is the same
(C) A couple cannot be balanced by a single force but can be balanced only by a couple of opposite sense
(D) All of the above

Correct Answer
Answer: Option D

9. The three forces of 100 N, 200 N and 300 N have their lines of action parallel to each other but act in the opposite directions. These forces are known as

(A) Coplanar concurrent forces
(B) Coplanar non-concurrent forces
(C) Like parallel forces
(D) Unlike parallel forces

Correct Answer
Answer: Option D
10. Moment of inertia of a hollow circular section, as shown in the below figure about an axis perpendicular to the section, is ________ than that about X-X axis.

![Diagram of a hollow circular section](image)

- (A) Two times
- (B) Same
- (C) Half
- (D) None of these

Correct Answer
Answer: Option A

11. The moment of a force

- (A) Is the turning effect produced by a force, on the body, on which it acts
- (B) Is equal to the product of force acting on the body and the perpendicular distance of a point and the line of action of the force
- (C) Is equal to twice the area of the triangle, whose base is the line representing the force and whose vertex is the point, about which the moment is taken
- (D) All of the above

Correct Answer
Answer: Option D
12. A cable with a uniformly distributed load per horizontal meter run will take the following shape

- (A) Straight line
- (B) Parabola
- (C) Hyperbola
- (D) Elliptical

Correct Answer
Answer: Option B

13. In a framed structure, as shown in the below figure, the force in the member BC is

- (A) \( \frac{W}{\sqrt{3}} \) (compression)
- (B) \( \frac{W}{\sqrt{3}} \) (tension)
- (C) \( \frac{2W}{\sqrt{3}} \) (compression)
- (D) \( \frac{2W}{\sqrt{3}} \) (tension)

Correct Answer
Answer: Option D

14. D' Alembert's principle is used for

- (A) Reducing the problem of kinetics to equivalent statics problem
- (B) Determining stresses in the truss
- (C) Stability of floating bodies
- (D) Designing safe structures

Correct Answer
Answer: Option A

15. A pair of smith's tongs is an example of the lever of

- (A) Zeroth order
- (B) First order
16. Moment of inertia of a circular section about its diameter \((d)\) is

- (A) \(\pi d^3/16\)
- (B) \(\pi d^3/32\)
- (C) \(\pi d^3/32\)
- (D) \(\pi d^3/64\)

Correct Answer

Answer: Option C

17. The resultant of two forces \(P\) and \(Q\) acting at an angle \(\theta\) is

- (A) \(\sqrt{(P^2 + Q^2 + 2PQ \sin\theta)}\)
- (B) \(\sqrt{(P^2 + Q^2 + 2PQ \cos\theta)}\)
- (C) \(\sqrt{(P^2 + Q^2 - 2PQ \cos\theta)}\)
- (D) \(\sqrt{(P^2 + Q^2 - 2PQ \tan\theta)}\)

Correct Answer

Answer: Option B

18. A circular hole of 50 mm diameter is cut out from a circular disc of 100 mm diameter as shown in the below figure. The center of gravity of the section will lie

- (A) In the shaded area
19. Two non-collinear parallel equal forces acting in opposite direction
   (A) Balance each other
   (B) Constitute a moment
   (C) Constitute a couple
   (D) Constitute a moment of couple

Correct Answer
Answer: Option C

20. One joule means that
   (A) Work is done by a force of 1 N when it displaces a body through 1 m
   (B) Work is done by a force of 1 kg when it displaces a body through 1 m
   (C) Work is done by a force of 1 dyne when it displaces a body through 1 cm
   (D) Work is done by a force of 1 g when it displaces a body through 1 cm

Correct Answer
Answer: Option A

21. On the ladder resting on the ground and leaning against a smooth vertical wall, the force of friction will be
   (A) Downwards at its upper end
   (B) Upwards at its upper end
   (C) Perpendicular to the wall at its upper end
   (D) Zero at its upper end

Correct Answer
Answer: Option D
22. When trying to turn a key into a lock, following is applied

- (A) Coplanar force
- (B) Non-coplanar forces
- (C) Moment
- (D) Couple

Correct Answer
Answer: Option D

23. According to law of triangle of forces

- (A) Three forces acting at a point will be in equilibrium
- (B) Three forces acting at a point can be represented by a triangle, each side being proportional to force
- (C) If three forces acting upon a particle are represented in magnitude and direction by the sides of a triangle, taken in order, they will be in equilibrium
- (D) If three forces acting at a point are in equilibrium, each force is proportional to the sine of the angle between the other two

Correct Answer
Answer: Option C

24. A couple produces

- (A) Translatory motion
- (B) Rotational motion
- (C) Combined translatory and rotational motion
- (D) None of the above

Correct Answer
Answer: Option B

25. The force, by which the body is attracted, towards the center of the earth, is called

- (A) Impulsive force
- (B) Mass
- (C) Weight
- (D) Momentum

Correct Answer
Answer: Option C
26. If three forces acting in different planes can be represented by a triangle, these will be in

- (A) Non-equilibrium
- (B) Partial equilibrium
- (C) Full equilibrium
- (D) Unpredictable

Correct Answer
Answer: Option A

27. Coplanar non-concurrent forces are those forces which _________ at one point, but their lines of action lie on the same plane.

- (A) Meet
- (B) Do not meet
- (C) Either ‘A’ or ‘B’
- (D) None of these

Correct Answer
Answer: Option B

28. Which of the following do not have identical dimensions?

- (A) Momentum and impulse
- (B) Torque and energy
- (C) Torque and work
- (D) Moment of a force and angular momentum

Correct Answer
Answer: Option D

29. In order to determine the effects of a force, acting on a body, we must know

- (A) Magnitude of the force
- (B) Line of action of the force
- (C) Nature of the force i.e. whether the force is push or pull
- (D) All of the above

Correct Answer
Answer: Option D
30. Two like parallel forces are acting at a distance of 24 mm apart and their resultant is 20 N. It the line of action of the resultant is 6 mm from any given force, the two forces are

- (A) 15 N and 5 N
- (B) 20 N and 5 N
- (C) 15 N and 15 N
- (D) None of these

Correct Answer

Answer: Option A

31. Varignon's theorem of moments states that if a number of coplanar forces acting on a particle are in equilibrium, then

- (A) Their algebraic sum is zero
- (B) Their lines of action are at equal distances
- (C) The algebraic sum of their moments about any point in their plane is zero
- (D) The algebraic sum of their moments about any point is equal to the moment of their resultant force about the same point

Correct Answer

Answer: Option D

32. The motion of a wheel of a car is

- (A) Purely translation
- (B) Purely rotational
- (C) Combined translation and rotational
- (D) None of these

Correct Answer

Answer: Option C

33. According to Lami’s theorem

- (A) The three forces must be equal
- (B) The three forces must be at 120° to each other
- (C) The three forces must be in equilibrium
- (D) If the three forces acting at a point are in equilibrium, then each force is proportional to the sine of the angle between the other two

Correct Answer
34. According to the law of moments, if a number of coplanar forces acting on a particle are in equilibrium, then

- (A) Their algebraic sum is zero
- (B) Their lines of action are at equal distances
- (C) The algebraic sum of their moments about any point in their plane is zero
- (D) The algebraic sum of their moments about any point is equal to the moment of their resultant force about the same point

Correct Answer
Answer: Option D

35. If a number of forces are acting at a point, their resultant is given by

- (A) \((\sum V)^2 + (\sum H)^2\)
- (B) \(\sqrt{(\sum V)^2 + (\sum H)^2}\)
- (C) \((\sum V)^2 + (\sum H)^2 + 2(\sum V)(\sum H)\)
- (D) \(\sqrt{(\sum V)^2 + (\sum H)^2 + 2(\sum V)(\sum H)}\)

Correct Answer
Answer: Option B

36. Moment of inertia is the

- (A) Second moment of force
- (B) Second moment of area
- (C) Second moment of mass
- (D) All of these

Correct Answer
Answer: Option

37. A redundant frame is also called ________ frame.

- (A) Perfect
- (B) Imperfect
- (C) Deficient
- (D) None of these
38. The unit of force in S.I. system of units is

- (A) Dyne
- (B) Kilogram
- (C) Newton
- (D) Watt

Answer: Option C

39. The resultant of the two forces ‘P’ and ‘Q’ is ‘R’. If ‘Q’ is doubled, the new resultant is perpendicular to ‘P’. Then

- (A) $P = Q$
- (B) $Q = R$
- (C) $Q = 2R$
- (D) None of these

Answer: Option B

40. The process of finding out the resultant force is called _________ of forces.

- (A) Composition
- (B) Resolution
- (C) Decomposition
- (D) None of these

Answer: Option A