1) The force of friction between two bodies in contact
   (a) Depends upon the area of their contact
   (b) Depends upon the relative velocity between them
   (c) Is always normal to the surface of their contact
   (d) All of the above

2) The magnitude of the force of friction between two bodies, one lying above the other, depends upon the roughness of the
   (a) Upper body (b) Lower body (c) Both the bodies (d) The body having more roughness

3) The force of friction always acts in a direction opposite to that
   (a) In which the body tends to move
   (b) In which the body is moving
   (c) Both (a) and (b)
   (d) None of the two

4) Which of the following statement is correct?
   (a) The force of friction does not depend upon the area of contact
   (b) The magnitude of limiting friction bears a constant ratio to the normal reaction between the two surfaces
   (c) The static friction is slightly less than the limiting friction.
   (d) All of the above

5) If a ladder is not in equilibrium against a smooth vertical wall, then it can be made in equilibrium by
   (a) increasing the angle of inclination.
   (b) decreasing the angle of inclination.
   (c) increasing the length of the ladder.
   (d) decreasing the length of the ladder.

6) A body of mass 10 kg is at rest on a horizontal plane. The coefficient of friction is 0.25. What is the minimum force required to just move the block? (g= 9.81 m/s^2)
   (a) 255.25N
   (b) 245.25N
   (c) 24.525 N
   (d) 230.25N

7) A body of mass 10 kg is at rest on a horizontal floor. The coefficient of friction is 0.25. Comment about the state of the body if it is acted by an external force of 250 N?
   (a) Body will be about to move
   (b) Body will be at rest
   (c) Body will be in motion
   (d) Data given is insufficient

8) A stone is dropped into a well is heard to strike the water in 4 seconds. Find the depth at which the water level is from the top of the well, assuming the velocity of the sound to be 335 m/s (take g=9.81 m/s^2)
   (a) 70.35 m
   (b) 75.45 m
   (c) 60.45 m
   (d) 77.55 m

9) A particle travels on a circular path, whose distance travelled is defined by $S=(0.5t^3+3t)$ m. if the total acceleration is 10m/s^2, at t = 2 sec, find the radius of curvature.
   (a) 10.125 m
   (b) 15.152 m
   (c) 5.50 m
   (d) 12.12 m

10) During a test, the car moves in a straight line such that for a short time its velocity is defined by $v = (9t^2 + 2t)$ m/s where t is in seconds. Determine its position when t = 3 sec.

(a) Position = 70 m
(b) Position = 80 m
(c) Position = 90 m
(d) Position = 100 m

11) Which of the following is not a projectile?
(a) a bullet fired from a rifle
(b) a bomb dropped from an aeroplane
(c) hydrogen balloon floating in air
(d) a boy throw a ball oblique with vertical.

12) A train enters curve of radius 800 m with a speed of 20 m/s, what will be the magnitude of tangential and normal acceleration at the instant the brakes are applied so that the train stops by covering a distance of 500 m along the curve.
(a) tangential acceleration = 0.4 m/s^2, normal acceleration = 0.5 m/s^2
(b) tangential acceleration = 0.4 m/s^2, normal acceleration = - 0.5 m/s^2
(c) tangential acceleration = - 0.4 m/s^2, normal acceleration = - 0.5 m/s^2
(d) tangential acceleration = - 0.4 m/s^2, normal acceleration = 0.5 m/s^2

13) Kinematics of the rigid body is
(a) Study of geometry of motion considering the cause of motion
(b) Study of external forces acting on it without considering the geometry of motion
(c) Study of geometry of motion without considering the cause of motion
(d) Finding the reaction forces and moments at the supports

14) A motorist travelling at a speed of 70 km/hr suddenly applied brakes and halts after skidding 50 m. What is the acceleration of the motorist?
(a) Accerleration = - 2.78 m/s^2
(b) Accerleration = 2.78 m/s^2
(c) Accerleration = - 3.78 m/s^2
(d) Accerleration = 3.78 m/s2

15) Coefficient of friction is the
(a) Angle between normal reaction and the resultant of normal reaction and the limiting friction
(b) Ratio of limiting friction and normal reaction
(c) The friction force acting when the body is just about to move
(d) The friction force acting when the body is in motion

16) A particle moves along a straight line such that distance (x) traversed in t seconds is given by $x = t^2(4 - t) + 7$ m, the acceleration of the particle, at time, t, equal to 1 second will be _____ m/s^2
(a) 11
(b) 5
(c) 2
(d) 7

17) An elevator is moving with constant acceleration acquires an upward velocity of 5 m/s over a distance of 10 m. If it starts from rest, find the magnitude of the acceleration.
(a) 2.5 m/s^2
(b) 1.25 m/s^2
(c) 2 m/s^2
(d) 5 m/s^2

18) Which one of the following statements is TRUE?
(a) the tangent of the coefficient of friction is equal to the angle of friction
(b) the angle of repose is always greater than the angle of friction
(c) the angle of repose is always less than the angle of friction
(d) Limiting frictional force is directly proportional to the normal reaction.

19) A cricket ball hit in the air by the batsman, with velocity 'u' inclined with the horizontal with angle 'α', reaches the boundary in a projectile fashion. Assuming the batsman's height to be zero, the horizontal distance travelled by the ball is given by _____.
   (a) $\frac{4u^2 sin\propto}{2g}$
   (b) $\frac{2u^2 sin3\propto}{g}$
   (c) $\frac{u^2 sin2\propto}{g}$
   (d) $\frac{u^2 sin\propto}{2g}$

20) Frictional Force depends upon
   (a) Area of contact surface
   (b) Shape of the body
   (c) Normal reaction
   (d) Color of the body

21) The angle made by the resultant of normal reaction and frictional force with the normal reaction at the point of impending motion is called
   (a) Angle of friction
   (b) Angle of repose
   (c) Angle of plane
   (d) Angle of normal reaction

22) The x and y coordinates of the position of a particle moving in curvilinear motion are defined by $x=2+3t^3$ and $y=3+t^2$. Determine the acceleration at t=2 sec
   (a) 37.22 m/s^2
   (b) 16.22 m/s^2
   (c) 12.53 m/s^2
   (d) 36.06 m/s^2

23) A man standing on an open truck moving with uniform acceleration throws a ball vertically upwards. The ball will fall
   (a) Behind the truck
   (b) Into his hands
   (c) A head of the truck
   (d) Nowhere

24) A free fall of a body is an example of
   (a) Non-uniform motion
   (b) Uniform motion
   (c) Constant acceleration motion
   (d) Projectile motion

25) We are given an equation of displacement (s) in terms of time (t). If we differentiate it with respect to t, the equation so obtained will give
   (a) velocity
   (b) acceleration
   (c) distance traversed
   (d) Jerk

26) Which of the following statement is wrong?
   (a) A body falling freely under the force of gravity is an example of motion under variable acceleration.
   (b) A bus going down the valley may have variable acceleration.
   (c) A lift going down in a gold mine cannot have constant acceleration in the entire journey.
   (d) In a cricket match, the ball does not move with constant acceleration.

27) If we differentiate an equation in terms of acceleration and time, it will give
   (a) velocity
   (b) distance traversed

(c) displacement
(d) Jerk

28) We are given an equation of acceleration (a) in terms of time (t). The second integration of the equation will give the velocity.
(a) velocity
(b) distance traversed
(c) displacement
(d) Jerk

29) Time of flight of a projectile on a horizontal plane is given by_____. (the notations have their usual meaning)
(a) $T = \frac{2u \sin\theta}{3g}$
(b) $T = \frac{2u \sin\theta}{g}$
(c) $T = \frac{4u \sin\theta}{3g}$
(d) $T = \frac{2u \sin 2\theta}{g}$

30) The range of projectile is maximum when the angle of projection is:
(a) 30^0
(b) 45^0
(c) 60^0
(d) 90^0

31) The horizontal range of a projectile is:
(a) $R = \frac{u \sin 2\theta}{g}$
(b) $R = \frac{u^2 \sin 2\theta}{g}$
(c) $R = \frac{u \sin 2\theta}{2g}$
(d) $R = \frac{u^2 \sin 2\theta}{2g}$

32) The path of the projectile is given by:
(a) $y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$
(b) $y = x\tan\theta - \frac{gx^2}{2u^2\sin^2\theta}$
(c) $y = x\tan\theta - \frac{gx^2}{2u^2\cot^2\theta}$
(d) $y = x\tan\theta - \frac{gx^2}{2u^2\tan^2\theta}$

33) If a particle is moving along a curved path, then it is said to perform ___ motion.
(a) Motion under gravity
(b) Rectilinear Motion
(c) Curvilinear Motion
(d) Translational Motion

34) In curvilinear motion if velocity is constant then _____ is zero.
(a) a_X
(b) a_Y
(c) a_N
(d) a_T

35) Slope of v-t curve gives us:
(a) Displacement
(b) Jerk
(c) Acceleration
(d) Velocity

36) Radius of curvature in curvilinear motion is given by:
(a) $\rho = \left|\frac{[1+(\frac{dy}{dx})^2]^{3/2}}{\frac{d^2y}{dx^2}}\right|$
(b) $\rho = \left|\frac{[1+(\frac{dy}{dx})^2]^{2/3}}{\frac{d^2y}{dx^2}}\right|$
(c) $\rho = \left|\frac{[1-(\frac{dy}{dx})^2]^{3/2}}{\frac{d^2y}{dx^2}}\right|$
(d) $\rho = \left|\frac{[1-(\frac{dy}{dx})^2]^{2/3}}{\frac{d^2y}{dx^2}}\right|$

37) Area under a-t curve gives us:
(a) Change in velocity
(b) Change in displacement
(c) Change in acceleration
(d) Change in distance travelled

38) When acceleration is constant, then _____ is zero.
(a) Velocity
(b) Displacement
(c) Acceleration
(d) None of these

39) Displacement of a body is a _____ quantity.
(a) Scalar
(b) Vector
(c) Dimensionless
(d) None of the above

40) The maximum height of a projectile on a horizontal range is
(a) $H = \frac{u^2 \sin 2\alpha}{2g}$
(b) $H = \frac{u^2 \sin \alpha}{2g}$
(c) $H = \frac{u^2 \sin^2 2\alpha}{2g}$
(d) $H = \frac{u^2 \sin^2 \alpha}{2g}$

41) Distance travelled in the n^{th} second is given by:
(a) $s_{n^{th}} = u + \frac{(2n-1)\times a}{2}$
(b) $s_{n^{th}} = u + \frac{(n-1)\times a}{2}$
(c) $s_{n^{th}} = \frac{u}{2} + \frac{(2n-1)\times a}{2}$
(d) $s_{n^{th}} = u + \frac{(2n-1)\times a}{4}$

42) Co-efficient of static friction always _____ than the co-efficient of kinetic friction.
(a) Greater
(b) Less
(c) Equal
(d) Zero

43) Limiting frictional force is directly proportional to _____.
(a) Weight
(b) Mass
(c) Area
(d) Normal reaction

44) If two projectiles having same velocity of projection, but complementary angle of projection, then the range of both the projectiles will be _____.

(a) Same
(b) Different
(c) Zero
(d) None of these

45) If the inclination of the plane with horizontal is less than the angle of friction, then the block kept on the incline will _____.
(a) move downward
(b) move upward
(c) be in equilibrium
(d) be in motion

46) The cause of friction between the two surfaces is _____.
(a) material
(b) roughness
(c) material & roughness
(d) none of these

47) A wedge is generally used to lift a heavy load by a _____ distance.
(a) large
(b) small
(c) zero
(d) huge

48) In projectile motion, _____ component of velocity remains constant.
(a) X - component
(b) Y – component
(c) Z – component
(d) All of these

49) In projectile motion, _____ component of velocity at highest point ($H = H_{max}$) is zero.
(a) X - component
(b) Y – component
(c) Z – component
(d) All of these

50) Radius of curvature in curvilinear motion is given by:
(a) $\rho = \left| \frac{(v_x^2+v_y^2)^{\frac{3}{2}}}{v_x a_y - v_y a_x} \right|$
(b) $\rho = \left| \frac{(v_x^2+v_y^2)^{\frac{5}{2}}}{v_x a_y - v_y a_x} \right|$
(c) $\rho = \left| \frac{(v_x^2+v_y^2)^{\frac{3}{2}}}{v_x a_x - v_y a_y} \right|$
(d) $\rho = \left| \frac{(v_x^2+v_y^2)^{\frac{2}{3}}}{v_x a_y - v_y a_x} \right|$