Kavin's Physics Study Materials

TRB (SCERT-DIET)-2016

Classical Mechanics

Test –II

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Classical mechanics

1. Constraints that are expressed by inequalities are known as
   a) rhenomic
   b) holonomic
   c) scleronomic
   d) non-holonomic

2 If the constraints on the system are increased the no. of degrees of freedom
   a) Increases
   b) decreases
   c) has no change
   d) none of these

3 The generalized momentum corresponding to a cyclic coordinate is
   a) Zero
   b) Infinity
   c) Constant
   d) Negative

4. Work done by infinity force constraints during virtual displacement is
   a) Zero
   b) infinity
   c) Imaginary
   d) either real or imaginary

5. In configuration space, if the no. of particles of the system is N and equation of constraints is K the no of degrees of freedom
   a) $N - K$
   b) $N + K$
   c) $3N + K$
   d) $3N - K$

6. Virtual displacement in configuration space
   a) it does not take any time
   b) it takes the minimum path
   c) it takes the maximum path
   d) it not only obeys laws of conservation of energy

7. Hamiltonian H is the function of
   a) Position only
   b) Momentum only

c) Time only
d) All of these

8. An example of constrained motion is
a) motion of simple pendulum
b) beads sliding on a horizontal wire
c) motion of a particle on the surface of the sphere
d) all these

9. A free particle is one for which
a) there is not generalized co-ordinate
b) total energy is zero
c) kinetic energy is infinity
d) potential energy is zero

10. The lagrangian (L) of a free particle is equal to
a) kinetic energy (T)
b) potential energy (V)
c) total energy=(T)+(V)
d) none of these

11. The generalized force Q_k is given by
a) $\sum_i F_I \delta r_i$
b) $\sum_i F_i \frac{\partial r_i}{\partial q_k}$
c) $\sum_i \frac{\partial r_i}{\partial q_k}$
d) $\sum_i F_i \delta_k$

12. The generalized co-ordinate used to describe the motion of a simple pendulum of length l and angular induction θ is
a) l
b) θ
c) $l \; and \; \theta$
d) none of these

13. The product of inertia of a particle of mass 'm' at distances p_1 and p_2 from two places is
a) $\frac{p_1 p_2}{m}$
b) $\frac{m}{p_1 p_2}$

c) mp_1p_2
d) $none\ of\ these$

14.The quantity $\frac{\partial L}{\partial q_j}$ is called
a) generalized force
b) generalized velocity
c) generalized momentum
d) generalized coordinate

15.If the lagrangian (L) is not an explicit function of time, the Hamiltonian (H) is
a) a constant of motion
b) a constant
c) zero
d) infinity

16.When the system is conservative, the Hamiltonian (H) is conservative, Hamiltonian (H) represents
a) lagrangian (L)
b) total energy
c) kinetic energy
d) potential energy

17.When a particle moves in a central force field, the potential energy is a function of
b. a) r b) θ c) both r and θ d) neither r and θ

18.The virtual work done by the force of constraints for any dynamical system is zero. This is called
a) Principle of virtual displacement
b) Principle of virtual work
c) Principle of virtual least action
d) Principle of virtual least time

19.The constrait involved in the motion of molecules of a gas in a container is
a) holonomic
b) non-holonomic
c) neither a) or b)
d) zero

20.The workdone by a conservative force around a closed curve is
a) zero
b) infinity

c) negative
e) none of these

21. $\sum_i (F_i - P_i).\partial r_i = 0$ is called
a) Principle of virtual work
b) D'alembert principle
c) Fermat's principle
d) None of these

22. At wood machine is an example of
a) conservative system
b) holonomic constraints
c) both a) and b)
d) non-conservative system

23. The example of conservative force is
a) gravitational force
b) electrostatic force
c) elastic force
d) all of these

24. If the lagrangian of a system does not contain time explicitly, the total energy of the system is
a) Zero
b) Constant
c) Infinity
d) None of these

25. Phase space is having
a) 3-domensional
b) 6-dimensional
c) 9-dimensional
d) 2-dimensional

26. Phase space can also be called
a) $\mu - space$
b) L-space
c) R-space
d) None of these

27. How many coordinates for space and momentum are there in phase space
a) 1 space and 5 momentum

b) 2 space and 4 momentum
c) 3 space and 3 momentum
d) 4 space and 2 momentum

28. Which of the following is incorrect
a) $q_k = \frac{\partial_L}{\partial q_k}$
b) $-\frac{PK}{\partial q_k} = \partial L$
c) $\frac{-\partial L}{\partial t} = \frac{\partial H}{\partial t}$
d) $q_k = \frac{\partial_L}{\partial p_k}$

29. If lagrangian L is not explicit function of time, the Hamiltonian H is
a) Zero
b) Constant of time
c) Infinity
d) Undefined

30. The time integral of twice the kinetic energy is called
a) Lagrangian
b) Hamiltonian
c) Action
d) None of these

31. If the equation of constraint contains the time as an explicit variable, the constraint is
a) Rheonomic
b) Scleronomic
c) Holonomic
d) Non-holonomic

32. In Cartesian coordinate system for N-particle system, the number of degrees of freedom is
a) N
b) 3N
c) 2N
d) 6N

33. The effect of constraint on a system is
a) To increases the degrees of freedom
b) To decrease the degrees of freedom

c) To equal the degrees of freedom
d) None of these

34. For N particle system, having k-equations of constraints, the number of degrees of freedom is
a) N-K
b) 3N-K
c) N+K
d) 3N+K

35. If T is the kinetic energy and V is the potential energy the lagrangian L is
a) T+V
b) T-V
c) 2T+V
d) T+2V

36. The constraints involved in the motion of the molecule in a gas container is an example of
a) Holonomic
b) Non-holonomic
c) rheonomic
d) Scleronomic

37. The generalized coordinates for simple pendulum is
a) R
b) M,r
c) M,r,s
d) θ

38. If the coordinate q_k is cyclic
a) It does not appear in lagrangian
b) It appears in lagrangian
c) It is repeating
d) It never comes in any calculations

39. Euler's angle are
a) Two
b) Three
c) Four
d) Five

40.For a particle mass'm' the product of inertia is

a) mp^2
b) mp_1p_2
c) m^2p
d) $\frac{m}{p^2}$

41.According to D' Alembert principle

a) $\sum_i F_i\delta r_i = 0$
b) $\sum_i p_i\delta r_i = 0$
c) $\sum_i(F_i - p_i)\delta r_i = 0$
d) $\sum_i(F_i - \dot{P}_i)\delta r_i = 0$

42.If H,L and T represents Hamiltonian, lagrangian and kinetic energy of a system respectively, the value of $\frac{(H+L)}{T}$ is

a) 1
b) 2
c) 3
d) 4

43.Hamiltonian canonical relation is

a) $\dot{q}_j = \frac{\partial H}{\partial P_j}$
b) $q_j = -\frac{\partial H}{\partial P_j}$
c) $q_j = \frac{\partial H}{\partial P_j}$
d) $\dot{q}_j = -\frac{\partial H}{\partial P_j}$

44.According to principle of least action

a) $\delta\int \sum_j p_j q_j dt = constant$
b) $\delta\int \sum_j p_j \dot{q}_j dt = 0$
c) $\delta\int \sum_j p_j q_j dt = 0$
d) None of these

45.Moment of inertia coefficient is expressed as

a) I_{xx}
b) I_{xy}
c) I_{yz}

d) I_{zx}

46. The simple pendulum of generalized coordinates required to describe the motion of simple pendulum
    a) 2
    b) 4
    c) 3
    d) 1
47. The product of inertia coefficient is
    a) I_{xx}
    b) I_{yy}
    c) I_{zz}
    d) I_{xy}
48. The Hamiltonian represents
    a) Potential energy
    b) Kinetic energy
    c) Total energy
    d) Difference in energy
49. Eulerian angle are totally
    a) Five
    b) Three
    c) Two
    d) Four
50. A non holonomic constraint may be expressed in the form of
    a) equality
    b) inequality
    c) vector
    d) none of these