Kavin's Physics Study Materials

TRB (SCERT-DIET)-2016

Classical Mechanics
Test –III

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1 Products of inertia about principal axes of inertia are
   a) Zero
   b) Infinity
   c) One
   d) Negative
2 The method of eliminating extra virtual displacement is called
   a) Routh's procedure
   b) Lagrangian undetermined multipliers
   c) Hamilton's principle
   d) Lagrangian method
3 The time integral of twice the kinetic energy is called
   a) Total energy
   b) Action
   c) Generalized force
   d) Force
4 When a small oscillation from the equilibrium position causes the system in bounded motion the equilibrium is said to be
   a) Unstable
   b) Stable
   c) Astable
   d) Bistable
5 During small oscillations, the external frequencies are
   a) Only fundamental
   b) Only harmonics
   c) Both fundamental and harmonics
   d) Neither fundamental nor harmonics
6 Normal modes have their displacement vector
   a) Changing magnitude only
   b) Changing in direction only
   c) Changing both in direction and magnitude
   d) Zero
7 Work done by a conservative force around a closed path is equal to
   a) One
   b) Zero
   c) Infinity

d) Negative

8 The gain in kinetic energy of a moving system is equal to work done on the system by all the operating force. This is called
a) Work-energy theorem
b) Energy law
c) Work principle
d) Operation condition

9 Linear momentum of a particle is conserved when
a) No work is done by it
b) No force is acting on it
c) Force acting is variable
d) Particle is in motion

10 If torque acting on a particle is zero, the following quantity it is conserved
a) Angular momentum
b) Linear momentum
c) Kinetic energy
d) Total energy

11 Euler's equation of motion the expression of
a) Angular momentum
b) Total moment of force
c) Linear momentum
d) Torque

12 $A\dot{\omega} - (B - C)W_Y W_Z = G_X$ is called
a) Poison's equation
b) Euler's equation of motion
c) Lagrange's equation
d) Hamilton's equation

13 A coordinate is cyclic if it does not appear in
a) Hamiltonian
b) Lagrangian
c) Equation of motion
d) Euler's equation

14 Routh 's procedure involves the procedure of
a) Lagrangian
b) Hamiltonian

c) Both a) and b)
d) None of these

15 Routh's procedure solves, Hamiltonian equation of
a) Cyclic coordinate
b) Non-cyclic coordinate
c) Generalized co-ordinates
d) None of these

16 For non-cyclic coordinates, routh's procedure solves
a) Hamilton's equation
b) Lagrangian equation
c) Euler's equation
d) Principle of least action

17 In a linear triatomic molecule, the normal frequencies $w = \sqrt{k/m}$ means
a) Each atom is equally displaced
b) Central atom remains at rest while the end atoms are displaced equally in opposite sense
c) Displacement of end atom is equal while that of the central atom is equal to end one's
d) No oscillatory motion

18 The y- component of angular velocity in terms of eulerian angle $\theta, \emptyset, \psi$
a) $w_y = \theta sin\psi - \phi sin\theta cos\psi$
b) $w_y = \dot{\phi} cos\,\psi - \dot{\phi} sin\theta sin\psi$
c) $w_y = \phi cos\theta + \psi$
d) $w_y = \psi sin\phi$

19 Kinetic energy of a rigid body interms of principal moment of inertia A,B and C is
a) $\frac{1}{2}\left(Aw_x^2 - Bw_y^2 - Cw_z^2\right)$
b) $\frac{1}{2}\left(A^2w_x^2 - B^2w_y^2 - C^2w_z^2\right)$
c) $\frac{1}{2}\left(Aw_x^2 + Bw_y^2 + Cw_z^2\right)$
d) None of these

20 Moment of inertia matrix is

a) Symmetric
b) Skew symmetric
c) Asymmetric
d) None

21 Euler's angle ϕ is the rotation of x, y, z
a) Clockwise about x- axis
b) Anticlockwise about x-axis
c) Anticlockwise about z- axis
d) Clockwise about z- axis

22 The magnitude of the central force is the function of
a) Time
b) Distance
c) Energy
d) Mass

23.The general form of Lagrange's equation is
a) a) $\frac{d}{dt}\frac{\partial T}{\partial \dot{q}_k} - \frac{\partial T}{\partial qk} = 0$
b) b) $\frac{d}{dt}\frac{\partial T}{\partial qk} - \frac{\partial T}{\partial qk} = 0$
c) c) $\frac{d}{dt}\frac{\partial T}{\partial qk} - \frac{\partial T}{\partial qk} = 0$
d) d) $\frac{d}{dt}\frac{\partial T}{\partial qk} - \frac{\partial T}{\partial qk} = 0$

24. According to the Principle of least action
a) $\sum_i P_i q_{idt=0}$
b) $\Delta \int_{t1}^{t2} \sum_i P_i q_{idt=0}$.
c) $\int \sum_i P_i q_{idt=0}$
d) $\Delta \int_{t1}^{t2} \sum_i P_i q_{idt=0}$.

25. The phase space is
a) 6N dimensional space
b) 3N dimensional space
c) Minkowski's space
d) Momentum space

26. The moment of inertia co efficient is expressed as
$a\ \ l_{YZ}$

b) l_{XY}

c) l_{XX}

d) l_{zX}

27. Lagrangian represents the

a) Kinetic energy of a system

b) Potential energy of a system

c) Sum of K.E and P.E

d) difference between K.E and P.E

28. The equation of motion of a simple Pendulum is

a) $\ddot{\Theta} - \frac{g}{l}.\theta = 0$

b) $\ddot{\Theta} + \frac{g}{l}.\theta = 0$

c) $\ddot{\Theta} + \frac{l}{g}.\theta = 0$

d) $\ddot{\Theta} - \frac{l}{g}.\theta = 0$

29. The relation between angular momentum ($\vec{L}$) angular velocity $\vec{\omega}$ and moment of inertia (I) is

a) $\vec{L} = I.\vec{\omega}$

b) $\vec{\omega} = I.\vec{L}$

c) $I = \vec{L}\vec{\omega}$

d) $\vec{L} = \vec{\omega}/I$

30. For equilibrium of a system, virtual work of the applied forces is

a) infinity

b) zero

c) Non-zero

d) negative

31. Hamiltonian represents the

a) Kinetic energy of a system

b) potential energy of a system

c) Total energy of a system

d) difference between K.E and P.E of a system

32. If a represents the action in mechanics, then according to the principle of action

a) A=0

b) $\Delta A = 0$

c) $\Delta A \neq 0\ but\ positive$

d) $\Delta A = is\ negative$

33. If F_i is the actual force and P_i the reversed effective force then D Alembert's Principle is given by

a)$\sum_i [Fi - Pi]\delta ri = 0$

b) $\sum_i [Pi - Fi]\delta ri = 0$

c)$\Delta \int_{t2}^{t1} \sum_i P_i q_{idt=0}$

d) $\int_{t2}^{t1} \sum_i P_i q_{idt=0}$

34. Generation of Body set of axes from space set of axes through three successive rotations gives

a) Lorentz transformations

b) Euler angles

C) a non-orthogonal transformation

d)non of these

35. Hamilton's Principle is stated as

a)$\delta 1 = \delta \int_{t2}^{t1} (H + \Delta H)dt = 0$

b) $\delta 1 = \delta \int_{t2}^{t1} (L + \Delta L)dt = 0$

c) $\delta 1 = \delta \int_{t2}^{t1} Ldt = 0$

d) $\delta 1 = \delta \int_{t2}^{t1} (H - \Delta H)dt = 0$

36. Phase space is

a)1-dimensional

b) 3-dimensional

c) 4-dimensional

d) 6-dimensional

37. From Newton's second law of motion in the equation $\frac{dP}{dt}$ =P linear momentum is conserved if

a) The total force is zero

b) total force is non-zero

c) Angular momentum changes

d) angular momentum doesn't changes

38.The number of independent walp in which a mechanical system can move without violating any constraint, which may be imposed, is called

a) number of degrees of freedom of the system

b) a holonomic constraint

c) a scleronomic constraint

d) a non-holonomic constraint

39.In the description of an object rolling on a rough surface without slipping, the description of motion involves

a) a holonomic constraint

b) a rheonomic constraint

c) a non-holonomic constraint

d) a scleronomic constraint

40.Lagrange's equation of motion is

a) Second order differential equation

b) Dependent on the co-ordinates used

c) Independent of time

d) A first order differential equation

41.Lagrange's equation of motion for one dimension L.H.O can be written as

a) $\frac{d}{dt}\left[\frac{\partial \mathrm{L}}{\partial \mathrm{x}}\right] - \left[\frac{\partial \mathrm{L}}{\partial \mathrm{x}}\right] = 0$

b) $\frac{d}{dt}\left[\frac{\partial \mathrm{L}}{\partial \mathrm{x}}\right] - \left[\frac{\partial \mathrm{L}}{\partial \mathrm{x}}\right] = 0$

c) $\frac{d}{dt}\left[\frac{\partial \mathrm{L}}{\partial \mathrm{x}}\right] = 0$

d) $\frac{\partial \mathrm{L}}{\partial \mathrm{x}} - \frac{\partial \mathrm{L}}{\partial \mathrm{x}} = 0$

42.Hamilton's canonical equations of motion are represented by

a) $q_i = \frac{\partial H}{\partial \dot{P}_j}$, $\dot{p}_j = -\frac{\partial H}{\partial q_j}$

b) $q_j = -\frac{\partial H}{\partial P_j}$, $p_j = -\frac{\partial H}{\partial q_j}$

c) $q_j = \frac{\partial H}{\partial P_j}$, $p_j = \frac{\partial H}{\partial q_j}$

d) none of these

43.The principle of least action for conservation system is expressed as

a) $\int_{t_1}^{t_2} \sum_j p_i q_i dt = 0$

b) $\int_{t_1}^{t_2} \sum_j p_i \dot{q}_i dt = 0$

c) $\int_{t_1}^{t_2} \sum_j p_i dt = 0$

d) none of these

44.L=IW implies that L is the angular momentum w. The angular velocity vector and I represents

a) Tensor of rank 3

b) a vector

c) Moment of inertia tensor of rank2

d) none of these

45. The number of generalized co-ordinates required to describe the position of the simple pendulum is

a) 2

b) 4

c) 1

d) 3

46.For non –conservative system the generalized potential should be the function of

a) U(q t)

b) U ($\dot{q}$,t)

c) U($\dot{q}$,q)

d) none of these

47. Generalized force is expressed as

a) $\sum_i F_i \delta r_i$

b) $\sum_i F_i \frac{\partial r_i}{\partial q_j}$

c) $\sum_i F_i \frac{\partial r_i}{\partial q_j} \partial q_j$

d) none of these

48.The Product of inertia co-efficient is

a) I_{XX}

b) I_{YY}

c) I_{zz}

d) I_{xy}

49.The total number of Euler's angle is

a) 4

b)2

c)5

d)3

50. 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