

नोट : दोनों खण्डों से निर्देशानुसार उत्तर दीजिए। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

खण्ड / Section-A

Attempt All questions:-

1x10= 10

- a- Define scleronomic and Rheonomic constraints.
- b- The constraints involved in the motion of the molecules in a gas container are-----.
- c- A bead sliding on a moving wire is an example of -----.
- d- Define cyclic or Ignorable co-ordinates.
- e- Define poisson's Bracket.
- f- Define potential.
- g- Define Lagrange's Bracket.
- h- Define equipotential surfaces.
- i- Define the Surface Density.
- j- Write the formula for potential of thin uniform rod at any point.

SECTION-A

2X5=10

2-Answer the following questions

- a- Define generalized force.
- b- $L = \frac{1}{2}m(\dot{r}^2 + r^2\dot{\theta}^2) + V(r)$. Identify the cyclic co-ordinate and the corresponding conservation law for the problem.
- c- Prove that if f does not depend on x explicitly then $f - y' \frac{\partial f}{\partial y'} = \text{constant}$
- d- Show that the poisson's bracket do not obey the commutative law of algebra.
- e- To find the potential of a uniform rod of infinite length in both the direction an any external point?

SECTION-B

Answer the following questions

12X5=60

3-Write down the Lagrange's equation when the Lagrange's function has the

$$\text{Form } L = \dot{a}_k a_k - \sqrt{(1 - \dot{a}_k^2)}$$

Or

Show that for a conservative system,

Where the co-ordinate transformation is independent of the Hamiltonian function H represents the total energy of the system.

4- Prove that the shortest distance between two points in a plane is a straight line.

Or

Prove that the shortest distance between two points on the surface of the sphere is the arc of the great circle connecting them.

5- Show that if the Hamiltonian is not an explicit function of time, it is a constant.

Or

What is the relation between Lagrange and poisson brackets?

6- Derive equation of motion in terms of poisson bracket.

Or

To find the potential of a thin uniform spherical shell at any point.

7- Prove that the potential of a circle of uniform surface density σ and radius "a" at a point on its circumference is $4\pi\sigma a$

Or

Find relation between the attraction and potential.