



RAN - 2103000206021001

RAN-2103000206021001**B.Sc. (Sem. VI) Examination April - 2023****Physics - PH-606 - Classical Mechanics and Solid State Physics****[Total Marks: 50****સૂચના : / Instructions**

(૧)

**નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of signs on your answer book**

Name of the Examination:

B.Sc. (Sem. VI)

Name of the Subject :

Physics - PH-606 - Classical Mechanics and Solid State Physics

Subject Code No.: 2103000206021001

Seat No.:

Student's Signature

- (2) Draw neat diagrams wherever necessary.
- (3) Symbols used in the paper have their usual meaning.
- (4) Figures to the right indicate full marks of the question.
- (5) Scientific calculator may be used.

Q.1**Answer briefly.****(10)**

1. According to Nearly Free electrons theory on which factor total volume enclosed by the Fermi surface depends?
2. Define fermi surface.
3. Why is moment of inertia not consider a vector nor a scalar?
4. Write down the equation of constrain for rigid body?
5. Mention any two property that occur in super conductor
6. Classify type I and type II semiconductors from the following.
Hg, Pb, NbTi, Nb₃Sn.
7. Which of the banks of rivers in the northern hemisphere are sharper than the others ?
8. Explain the concept of 'weightlessness' in a satellite.
9. When are the products of inertia zero?
10. What do you know about pseudo force?

Q. 2**Attempt any one of the following in details:****(7)**

- (a) Explain the effect of coriolis force on free fall of a body on earth surface.
Derive necessary equation of its deviation.

- (b) Show that the expression for the force observed in rotating coordinate system is $\vec{F}_{rot} = \vec{F}_{ine} - 2m\vec{\omega} \times \vec{v}_{rot} - m\vec{\omega} \times (\vec{\omega} \times \vec{r})$
Explain the different term of this equation.

Q.2 Attempt any one of the following: (3)

- (a) How does the coriolis force affect the flow of the wind?
(b) A body is falling freely from a height of 150 m above the surface of the earth. Calculate the time of flight and displacement due to coriolis force at the north pole.

Q.3 Attempt any one of the following in details: (7)

- (a) Find the moment of inertia of a thin uniform square plate of mass m , side 'a', relative to the axis which is parallel to its plane and passing through one of its diagonal.
(b) Obtain Euler's equation of motion for rigid body.

Q.3 Attempt any one of the following: (3)

- (a) Calculate angular momentum of ice skater spinning at 4 rev/s given his moment of inertia is 104 kgm^2 . He reduces his rate of spin by extending his arm, find his value of moment of inertia when his angular speed becomes 2 rev/s .
(b) Explain the term: moment of inertia and product of inertia. When are the products of inertia zero ?

Q.4 Attempt any one of the following in details: (7)

- (a) Explain construction of Fermi surface. Draw in k-space first three brillouin zone of a square lattice. Mapping the first three brillouin zone in the reduce zone scheme.
(b) Describe Harrison's construction of free electron Fermi surface in two dimensions.

Q.4 Attempt any one of the following: (3)

- (a) What is Fermi surface? Draw three energy bands of a linear lattice plotted in the extended, reduced and periodic zone scheme.
(b) Define electron orbits ,open orbit and hole orbits.

Q.5 Attempt any one of the following in details: (7)

- (a) Derive London equation and give their significance.
(b) Explain in detail Meissner effect.

Q.5 Attempt any one of the following: (3)

- (a) Explain isotope effect on super conductor.
(b) Explain type II superconductors.