# 2003000204040055
# EXAMINATION SEPTEMBER 2024 (ATKT EXAM)
# BACHELOR OF SCIENCE (FOURTH SEMESTER)
# GROUPS OF SYMMETRIES-II (ELECTIVE GENERIC)4002

[**Time: As Per Schedule]** **[Max. Marks: 50]**

**Instructions:**

1. **Fill up strictly the following details on your answer book**
   a. Name of the Examination: **BACHELOR OF SCIENCE (FOURTH SEMESTER)**
   b. Name of the Subject: **GROUPS OF SYMMETRIES-II (ELECTIVE GENERIC)4002**
   c. Subject Code No: **2003000204040055**
2. Sketch neat and labelled diagram wherever necessary.
3. Figures to the right indicate full marks of the question.
4. All questions are compulsory.

Seat No:

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Student's Signature

**Q.1 Check the validity of the following statements. (Any six)** **6**

1. Trans $N_2$-$F_2$ is a planer molecule.
2. In a group of symmetries of $H_2S$ each element is self-inverse.
3. The group of symmetries of $NH_3$ is isomorphic to that of a rectangle.
4. The group of symmetries of an isosceles triangle is an abelian group of order 3.
5. The group of symmetries of $PCL_3$ contains Rotation symmetry of order 4.
6. The multiplicative group of the fourth-roots of unity is isomorphic to group of symmetries of a square.
7. The group of symmetries of a square is a cyclic group.
8. The group of symmetries of $H_2$-$O_2$ contains Rotation symmetry of order 6.

**Q.2 Attempt any Two.** **14**

1. Discuss all possible symmetries of an equilateral triangle using figures. Also write the order of each of these symmetries.

2. Obtain group table for the symmetries of a rectangle. Is it commutative group? Justify your answer.

3. Show that the set of all possible symmetries of an isosceles triangle is a group under operation of composition of symmetries. Is there any generator in this group?

**Q.3 Attempt any Two.** **16**

1. Obtain group table for the symmetries of $H_2$-$O_2$. Write the inverse of each symmetry operation and also write order of each symmetry operation.

2. Discuss all possible symmetries of a molecule $CHCl_3$ using figures.

3. Discuss about all possible symmetry operations of molecule $H_2O$, show that these symmetry operations form a group under composition of symmetry. Is it abelian group?

**Q.4 Attempt any Two.** **14**

1. Show that the group of symmetries of a rectangle is isomorphic to that of $H_2O$.

2. Explain Isomorphism of two groups with illustration.

3. Show that the group of symmetries of an equilateral triangle is isomorphic to that of $NH_3$.

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