DMM-3103
Second Year B. Sc. (Sem. IV) Examination
March / April - 2016
Group of Symmetries - II
(EG - Mathematics)
(New Course)

Time : 2 Hours] [Total Marks : 50

Instructions :

(1)
Fill up strictly the details of the examination on your answer book.
Name of the Examination : Second Year B. Sc. (Sem. IV)
Name of the Subject : Group of Symmetries - II (EG - Mathematics) (New)
Seat No. : 0
Student’s Signature

(2) All questions are compulsory.
(3) Figures to the right indicate marks of the corresponding question.

1 Check the validity of the following statements : (Any five) 5
(1) The multiplicative group of all forth roots of unity are isomorphic to group of symmetries of a rectangle.
(2) The order of group of symmetries of an isosceles triangle is 2.
(3) The group of symmetries of a square is a commutative group of order 4.
(4) PCl₃ is a planar molecule.
(5) The group of symmetries of H₂O is a cyclic group.
(6) The group of symmetries of a rectangle is an abelian group of order 6.

2 (a) Explain different types of symmetries of an equilateral triangle by drawing figures.

OR

(a) Show that the set of all possible symmetries of a rectangle is a group under operation of composition of symmetries. Is it a cyclic group?
(b) Attempt any one:

(1) Explain by drawing figures different types of symmetries of a square.

(2) Show that the set of all possible symmetries of an isosceles triangle is a group under operation of composition of symmetries.

3 (a) Check whether the multiplicative group $G = \{6, 12, 18, 24\}$ with $X_{30}$ is isomorphic to group of symmetries of a rectangle or not.

OR

(a) Explain by drawing figures, different types of symmetries of $\text{NH}_3$.

(b) Attempt any one:

(1) Show that the set of all possible symmetries of trans $\text{N}_2\text{F}_2$ is a group under composition of symmetry.

(2) Show that the set of all possible symmetries of $\text{H}_2\text{O}$ is a group under composition of symmetry. Is it a commutative group?

4 (a) Check whether the multiplicative group of the forth-roots of unity is isomorphic to group of symmetries of a rectangle or not.

OR

(a) Show that the multiplicative group of the square-roots of unity is isomorphic to group of symmetries of an isosceles triangle.

(b) Attempt any one:

(1) Show that the group of symmetries of an equilateral triangle is isomorphic to that of $\text{CHCl}_3$.

(2) Show that the group of symmetries of a rectangle is isomorphic to that of trans $\text{H}_2\text{O}_2$. 