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JB-3119

Second Year B. Sc. (Sem. III) Examination

March/April – 2013

Group Of Symmetries : Paper - I

(IDS - Mathematics)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **S. Y. B. SC. (SEM. 3)**

Name of the Subject :

☛ **GROUP OF SYMMETRIES : PAPER - 1 (IDS - MATHEMATICS)**

☛ Subject Code No. : **3 1 1 9** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate marks of the corresponding question.

(4) Follow the usual notations.

1 Answer the following. **10**

(i) Define group and cyclic group.

(ii) Define symmetry operation and state different types of symmetry operations.

(iii) Explain Identity symmetry operation.

(iv) Define. Generator of a group, Abelian group.

(v) Check the validity of the following statements :

(a) Identity symmetry operation is denoted by I.

(b) Order of Rotation symmetry operation is 2.

2 (a) Show that the set of all complex numbers with operation of addition is an infinite abelian group. **8**

OR

2 (a) Show that the set $G = \{m^a : a \in Z, \text{m is a fixed non - zero integer}\}$ is an infinite abelian group with the operation of multiplication.

(b) Attempt any one : **7**

(i) Show that the set of all possible cube roots of unity is a group under operation of multiplication.

(ii) Show that the set $G=\{1,3,5,7\}$ is a commutative group with $\times_8$ Is it a cyclic group?

3 (a) Define subgroup. Show that (I,+) is a subgroup of (R,+). 8

OR

(a) Show that a non-empty subset H of a group G is a subgroup of G if and only if $a,b \in H \Rightarrow ab^{-1} \in H$

(b) Attempt any one : **7**

(i) Show that the set $G=\{0,1,2,3,4,5\}$ is a group with addition modulo 6. Is it a commutative group?

(ii) Define inverse of an element in a group. Prove that $(aob)^{-1}=b^{-1}oa^{-1}$.

4 (a) Explain Reflection symmetry with illustration. 8

OR

(a) Explain the general idea of symmetry with illustrations.

(b) Attempt any one : **7**

(i) Explain Inversion symmetry with illustration.

(ii) Show that :

(a) Identity element in a group is unique.

(b) Inverse of an element in a group is unique.

5 (a) Explain Improper Rotation symmetry with illustration. 8

OR

(a) Explain Rotation symmetry with illustration.

(b) Attempt any one : **7**

(i) Define : Order of a group. Show that cancellation laws hold in a group.

(ii) Show that the set $G=\{6,12,18,24\}$ is a group with respect to operation multiplication modulo 30.