

JB-3119

Second Year B. Sc. (Sem. III) Examination March/April - 2013

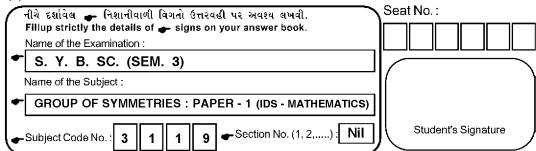
Group Of Symmetries: Paper - I

(IDS - Mathematics)

Time: 3 H	oursl	[Total	Marks	:	70
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Instructions:

(1)



- (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.

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- (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.

OR

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

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		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 $(R,+)$. 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:	
		(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)	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.	

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Show that the set of all possible cube roots of unity is

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[100]

(b) Attempt any one:

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