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S.Y.B.Sc. (Sem. III) Examination

March - 2023

Group of Symmetries - I (EG - Mathematics)

Time: 2 Hours] **[Total Marks: 50**

સૂચના : / Instructions

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

Name of the Examination:

☛ **S.Y.B.Sc. (Sem. III)**

Name of the Subject :

☛ **Group of Symmetries - I (EG - Mathematics)**

Subject Code No.: **1903000203040054**

Seat No.:

Student's Signature

(2) All questions are compulsory.

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

(4) There are three sections A, B, C in this question paper having 26 questions.
- Section- A: Question No. 1 to 11 each of 1 mark.
- Section -B: Question No. 12 to 17 each of 2 mark.
- Section- C: Question No. 18 to 26 each of 3 mark.

(5) There is only one correct answer for each question.

(6) Follow usual symbols.

***O.M.R. Sheet* ભરવા અંગેની અગત્યની સૂચનાઓ આપેલ**
***O.M.R. Sheet*ની પાછળ છાપેલ છે.**
Important instructions to fillup O.M.R. Sheet
are given on back side of the provided O.M.R. Sheet.

SECTION - A 11

1. The Rotation symmetry operation is denoted by _____.
   a) I b) E
   c) C d) σ

2. A group (G,*) is called an abelian group if it _____.
   a) has finite number of elements b) satisfies commutative property
   c) has infinite number of elements d) has a generator.

3. The _____ symmetry operation keeps everything fixed.
   a) Inversion b) Reflection
   c) Identity d) Rotation

4. Improper rotation symmetry operation keeps _____ fixed.
   a) a plane b) a line
   c) a point d) everything

5. If there exist a generator in a group, then the group is _____ group.
   a) an abelian b) a cyclic
   c) an infinite d) a finite

6. If the angle of rotation is 90° then it is _____ symmetry.
   a) C4 b) C2
   c) C3 d) C6

7. The order of an element 'a' in a group (G,.) is n if _____
   a) (G,.) is a finite group and has n elements.
   b) (G,.) is an infinite group and has n elements.
   c) $a^n = e$, where $n \in N$
   d) $a^n = e$, $\forall a \in G$

8. The Improper rotation symmetry is the combination of _____
   a) reflection symmetry and inversion symmetry.
   b) rotation symmetry and reflection symmetry.
   c) reflection symmetry and identity symmetry.
   d) rotation symmetry and inversion symmetry

9. In an Abelian group there _____ identity element.

a) are two
b) is no
c) is only one
d) are more than two

10. Every object has _____.

a) may or may not have any symmetry
b) at least one symmetry I
c) at least one symmetry E
d) no symmetry

11. A non-empty subset H of a group G is a subgroup of G if and only if _____

a) $a, b \in H \Rightarrow ab \in H$
b) $a, b, c \in H \Rightarrow a (bc) = (ab)c$
c) $a, b \in H \Rightarrow ab^{-1} \in H$
d) none of these

SECTION - B 12

12. In the multiplicative group of all possible symmetries of fourth roots of unity, the order of 1 and i are _____ respectively.

a) 1, 3
b) l, 2
c) 0, 1, 2
(D) 0, 2

13. The Inversion symmetry is denoted by _____ and its order is _____.

a) 1, 1
b) E, 1
c) I, 2
d) E, 2

14. Reflection symmetry keeps _____ fixed and its order is _____.

(A) plane, 1
b) plane, 2
c) line, 1
d) line, 2

15. The set $H = \{4a / a \in Z\}$ is a subgroup of a group _____.

a) (I, X)
b) (I, +)
c) (N,+)
d) $(R_0,+)$

16. The _____ symmetry is denoted by _____ and it's order is _____.

a) Identity, E, l respectively.
b) Inverse, E,2 respectively.
c) Identity, 1, 1 respectively.
d) Rotation, R ,2 respectively.

17. Set I of all integers with the operation of subtraction _____.

a) satisfies closure property, associative property and holds identity element.
b) satisfies closure property but doesn't hold associative property.
c) satisfies closure property, associative property but hasn't identity element.
d) satisfies associative property, holds identity element but doesn't hold closure property.

SECTION - C 27

18. In a group G = {1, 5, 7, 11, 13, 17} with the operation X_{18} order of elements 11, 13, 17 are _____ respectively.

a) 6, 3,6
b) 6,3.3
c) 1,6,3
d) 6,3,2

19. The set (Q, X) is not a subgroup of a group (R_0,X) because _____.

a) (Q, X) satisfies closure property but does not satisfies associative property
b) (Q, X) satisfies associative property but does not satisfies closure property
c) (Q, X) satisfies closure property but is not a subset of (R_0,X)
d) (Q, X) satisfies closure property but does not hold identity element

20. If the angle of rotation is 180^0, 90^0, 60^0 then the Rotation symmetry is denoted by _____ respectively.

a) C2, C4, C6
b) C4, C2,C6
c) C3, C4, C6
d) C2, C6, C3

21. σV is _____ symmetry through _____ and keeps _____ fixed.

a) Reflection, vertical plane, plane
b) Rotation, vertical line, line
c) Reflection, horizontal plane, plane
d) Rotation, horizontal line, line

22. In a group _____ each element of the group is an inverse of itself.
    a) (G, X_{30}), where G = {6,12,18,24}
    b) (C_0, X)
    c) (G, X_8), where G = {1,3,5,7}
    d) (G,X), where G = {l, -l, i, -i}

23. The set G = { m^a: a ∈ Z, m is a fixed non-zero integer } is _____.
    a) an infinite cyclic additive group
    b) an infinite abelian multiplicative group
    c) an infinite abelian additive group
    d) an infinite cyclic multiplicative group

24. The all possible symmetries of English letter "X" are _____.
    a) *E, C2,* σ
    b) *E, C2,* σ, *I*
    c) *C2,* σ, *I*
    d) *E, C4, C2,* σ

25. If R_0 is the set of all non-zero real numbers, then _____.
    a) the set of all natural numbers with operation of addition is a subgroup of $(R_0, +)$.
    b) the set of all natural numbers with operation of multiplication is a subgroup of (R_0, X).
    c) the set of all rational numbers with operation of multiplication is a subgroup of (R_0, X).
    d) the set of all non-zero rational numbers with operation of multiplication is a subgroup of (R_0, X).

26. The _____ symmetry operation is denoted by _____ and its order is _____ respectively.
    a) Identity, I, 1
    b) Identity, E, 0
    c) Inversion, I, 2
    d) Inversion, E,2

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SPACE FOR ROUGH WORK