



A Charutar Vidya Mandal's Institution
V.P. & R.P.T.P. SCIENCE COLLEGE (AUTONOMOUS)
(Grant-in-Aid)
Affiliated to Sardar Patel University
VALLABH VIDYANAGAR-389120



B.Sc (Semester 4) – March-2026
US04MAMTH02 : Group Theory

Date: 09/03/26

Time: 02:45pm to 4:15 pm

Day: Monday

Total marks : 30

Q-1 Write the most appropriate answer from the following multiple-choice questions. [06]

- 1 Inverse of 3 in $(Z_5^*, \times_5)$ is
(a) -3 (b) 2
(c) 4 (d) 3
- 2 Every non cyclic group has Generators.
(a) 1 (b) odd
(c) 2 (d) 0
- 3 Every cyclic group of order is simple group.
(a) 4 (b) even
(c)) prime (d) none of above
- 4 $\text{Ch}(Z)$ is
(a) 1 (b) ∞
(c) 0 (d) none of above
- 5 No. Of normal subgroups of Z_{15} are.....
(a) 3 (b) 15
(c) 2 (d) 4
- 6 The order of S_n / A_n is
(a) n (b) $n!/2$
(b) $n!$ (c) 2



Q-2 Prove that $R = \left\{ \begin{bmatrix} x & y \\ z & p \end{bmatrix} / x, y, z, p \in \mathbb{Z} \right\}$ Form a group under addition. (6Marks)

OR

Q-2 Prove that intersection of two subgroups of group G is also a subgroup of G. Give an example of it. (6Marks)

Q-3 Prove that every infinite cyclic group has exactly two generators.

(6Marks)

OR

Q-3 1. Prove that kernel of group homomorphism is a subgroup and normal subgroup.

(4Marks)

2. Find order of every elements of Klein-4 group.

(2marks)

Q-4 State and prove first isomorphism theorem for group.

(6Marks)

OR

Q-4 1. Let $f: R \rightarrow R'$ be any group homomorphism then prove that f is one-one $\Leftrightarrow \ker f = \{0\}$. (3marks)

2. Find all subgroups of $(Z_{14}, +_{14})$.

(3marks)

Q-5 1. Prove that every permutation can be expressed as a product of disjoint cycles.

(3Marks)

2. If $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 1 & 2 \end{pmatrix}$ find inverse of it and express it as a product of disjoint cycle

Also find its signature.

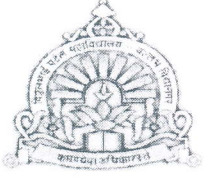
(3marks)

OR

Q-5 State and prove Cayley's theorem.

(6Marks)





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B.Sc (Semester 4) Quiz – March-2026
US04MAMTH02 : Group Theory

Date: 09/03/26

Time: 02:45pm to 4:15 pm

Signature of Examiner :

Day: Monday

Total marks :15

Obtained marks :

Q-1 Fill in the blanks with appropriate answer given in the bracket.

[08]

- (i) $(Z_{17}, +_{17})$ has normal Sub groups. { 17, 2, 3 }
- (ii) In $\{1, -1, i, -i\}$ order of -1 is..... { 1, 2, 4 }
- (iii)is not an abelian group. $\{(Z, +), (\mu_{22}(R), +), (Z_p, +_p)\}$
- (iv) is generator of group Z_9 . {1,3,9}
- (v) Every subgroup of group is normal subgroup. {cyclic, abelian, non cyclic}
- (vi) Order of permutation group S_n is $\{2n, n!, \frac{n!}{2}\}$
- (vii) $Z/pz \cong \dots\dots\dots$ $\{pz, Z_p, z\}$
- (viii) $O[Z_{18}/\{\bar{0}, \bar{6}, \bar{12}\}] = \dots\dots\dots$ {3,6,9}

Q-2 Whether the following statement is true or false. Write your answer in the box.

[07]

- (i) $\mathbb{Z}, \mathbb{Q}, \mathbb{R}$ are sub groups with Binary Operation +. []
- (ii) Klein 4 Group is cyclic but not abelian. []
- (iii) Infinite cyclic group has exctly one generator. []
- (iv) There are only two nontrivial automorphism of $\mathbb{Z}$ onto $\mathbb{Z}$. []
- (v) $O(i)$ in Q_8 is 4. []
- (vi) Signature of even permutation is -1. []
- (vii) $Z_2 \oplus Z_2 \simeq Z_4$. []
