

**B.Sc. PHYSICS
FOURTH SEMESTER
ABSTRACT ALGEBRA
BSM-742**

Duration : 1hrs30mins.

Full Marks: 35

Time : 10 min.

[PART-A: Objective]

Marks : 10

Choose the correct answer from the following:

1X10=10

1. A non-empty set A is termed as an algebraic structure _____
 - a. with respect to binary operation $*$
 - b. with respect to ternary operation $?$
 - c. with respect to binary operation $+$
 - d. with respect to unary operation $-$
2. The Condition for monoid is
 - a. $(a + e) = a$
 - b. $(a * e) = (a + e)$
 - c. $a = (a * (a + e))$
 - d. $(a * e) = (e * a) = a$
3. A group $(M, *)$ is said to be abelian if _____
 - a. $(x + y) = (y + x)$
 - b. $(x * y) = (y * x)$
 - c. $(x + y) = x$
 - d. $(y * x) = (x + y)$
4. An algebraic structure _____ is called a semi-group.
 - a. $(P, *)$
 - b. $(Q, +, *)$
 - c. $(P, +)$
 - d. $(+, *)$
5. A cyclic group is always
 - a. Abelian Group
 - b. Monoid
 - c. Semi group
 - d. Sub group
6. The inverse of -1 in the multiplication group $\{1, -1, i, -i\}$ is
 - a. 1
 - b. -1
 - c. i
 - d. $-i$
7. What is order of this group $\{1, \omega, \omega^2\}$
 - a. 0
 - b. 1
 - c. 2
 - d. 3

8. What is the generator of this Group $\{1, -1, i, -i\}$
- a. 1
 - b. -1
 - c. i
 - d. $-i$
9. The length of a transposition is
- a. 0
 - b. 1
 - c. 2
 - d. None
10. A map f is invertible if
- a. One-one
 - b. Both one-one and onto
 - c. onto
 - d. None of these

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(PART-B : Descriptive)

Time: 1 HRS 20 MINS

Marks : 25

[Answer question no.(1) & any two (2) from the rest]

1. Prove that $(A \cup B)^c = A^c \cap B^c$ and $(A \cap B)^c = A^c \cup B^c$. 5

2. a. If $f: A \rightarrow B$ and $g: B \rightarrow C$ are one-one mapping then $g \circ f$ is one-one. 5+5=10
b. Prove that A map f is invertible iff it is one-to one onto.

3. a. Prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$. 5+5=10
b. Lagrange's theorem: If G is a finite group and H is a subgroup of G then $O(H)$ divides $O(G)$

4. a. Show that $G = \{1, \omega, \omega^2\}$ is a Group. Is it abelian? Justify your answer. 5+5=10
b. Find the different powers of the cycle (1234). Write the order of the permutation.

5. Define Group and Cyclic Group. Show that $G = \{1, -1, i, -i\}$ is an abelian group. Is G a cyclic Group, find the order of this Group. 2+2+4+2=10

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