Branch : CSE/IT **Batch : Hinglish**

Discrete Mathematics II

Set Theory

DPP-09

[MSQ]

1. Which of the following is True?

(a) The union of any two sub groups of a group G is also a sub group of G.

(b) The intersection of any two sub groups of a groups of a group G is also a sub group of G.

(c) Let G = {0, ± k, ± 2k, ±3k, ±4k, …..∞} where k is any fixed integer is a group w.r.t. addition.

(d) Every sub group an abelian group is also an abelian group.

[MSQ]

2. Which of the following is True?

(a) every cyclic group is an abelian group

(b) if 'a' is generator of a cyclic group then a^{-1} is also a generator of G.

(c) The order of a cyclic group is equal to the order of its generating element.

(d) A sub group of a cyclic group need not be cyclic.

[NAT]

3. How many generators are there for the cyclic group $(\{1, 2, 3, 4, 5, 6\}, \oplus_7)$

[MCQ]

4. Which of the following is false?

(a) A cyclic group with only one generator can have at most 2 elements.

(b) The order of a cyclic group is equal to the order of its generator.

(c) The group $(\{1, 2, 3, 4\}, \otimes_5)$ is cyclic

(d) A group of order 4 is cyclic.

[MCQ]

5. Let S = {0, 1, 2, 3, 4, 5, 6, 7} and * denotes multiplication modulo 8 that is

$x * y = (xy) \bmod 8$.

Which of the following is a group w.r.t *?

(a) {0, 1} (b) {1, 4}

(c) {1, 3} (d) {1, 6}

Answer Key

1. **(b, c, d)**
2. **(a, b, c)**
3. **(2)**
4. **(d)**
5. **(c)**

Hints and Solutions

1. (b, c, d)

$G = \{1, 3, 5, 7\}$ is a group with respect to $\otimes_8$.

$H_1 = \{1, 3\}$ and $H_2 = \{1, 5\}$

$H_1 \cup H_2 = \{1, 3, 5\}$

Here, H_1 and H_2 are subgroup of G,

But $H_1 \cup H_2$ is not a subgroup of G.

2. (a, b, c)

Every sub group of a cycle group is cyclic (theorem)

3. (2)

Number of generator of $G = \phi(6)$

= Number of positive integers which are less than 6 and relatively prime to 6.

= 2

4. (d)

$G = \{1, 3, 5, 7\}$ is a group with respect to $\otimes_8$.

G is not cyclic, because the generating element does not exist.

5. (c)

(a) $\{0, 1\}$ is not a sub group, because inverse of 0 does not exist.

(b) $\{1, 4\}$ is not a sub group, because the set is not closed with respect to the given binary operation.

(c) $\{1, 3\}$ is closed with respect to *.

$\therefore \{1, 3\}$ is a group.

(d) $\{1, 6\}$ is not a sub group, because the set is not closed with respect to the given binary operation.