**United College of Engineering and Research, Allahabad**

**Department of Computer Science & Engineering**

**B.Tech CSE- III Semester**

**Set-2**

**Course Name:** Discrete Structure and Theory of Logic  **AKTU Course Code:**KCS-303

**Time: 45 Minutes Max. Marks: 30**

* **All Questions are compulsory.**
* **All Questions carry one mark.**

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| **Q. No.** | **Questions** | **CO** |
| **1** | A cyclic group is always \_\_\_\_\_\_\_\_\_ A) abelian group B) monoid C) semigroup D) subgroup | **CO2** |
| **2** | A function f:(M,∗)→(N,×) is a homomorphism if \_\_\_\_\_\_ A) f(a\*b) = a \* b B) f(a\*b) = a / b C) f(a\*b) = f(a) + f(b) D) f(a\*b) = f(a) x f(a) | **CO2** |
| **3** | **This is an abelian group { –3 n : n ∈ Z } under?** A. division B. subtraction  C. addition D. multiplication | **CO2** |
| **4** | **What is the inverse of – i If G = { 1, -1, i, – i } is group under multiplication?** A. −1 B. i C. 1 D. None of Above | **CO2** |
| **5** | **The monoid is a ….** A. a non-abelian group B. groupoid C. A group  D. a commutative group | **CO2** |
| **6** | **(**ba**)-1 =\_\_\_\_\_ If a, b are elements of a group G?** A. b-1 a  B. a-1 b C. b-1 a-1 D. a-1 b-1 | **CO2** |
| **7** | **What is the value of (a-1 b)-1 is in the group (G, .)?** A. b-1a B. ab-1 C. ba-1 D. a-1b | **CO2** |
| **8** | **What is the inverse of a , if (Z,\*) is a group with a\*b = a+b+1 ∀ a, b ∈Z?**  A. -2 B. 0 C. -a-2  D. a-2 | **CO2** |
| **9** | **What is the identity element in the group G = {2, 4, 6, 8) under multiplication modulo 10?**  A. 5  B. 9  C. 6  D. 12 | **CO2** |
| **10** | **Which statement is false?** A. The set of rational integers is an abelian group under addition B. The set of rational numbers form an abelian group under multiplication C. The set of rational numbers is an abelian group under addition  D. None of these | **CO2** |
| **11** | Let G be a group of order 6, and H be a subgroup of G such that 1<|H|<6. Which one of the following options is correct?   |  | | --- | | 1. Both G and H are always cyclic | | 1. G may not be cyclic, but H is always cyclic | | 1. G is always cyclic, but H may not be cyclic | | 1. Both G and H may not be cyclic | |  |
| **12** | A binary operation  on a set of integers is defined as x  y = x2 + y2. Which one of the following statements is TRUE about ?   |  | | --- | | 1. Commutative but not associative | | 1. Both commutative and associative | | 1. Associative but not commutative | | 1. Neither commutative nor associative | |  |
| **13** | Consider the set S = {1, ω, ω2}, where ω and w2 are cube roots of unity. If \* denotes the multiplication operation, the structure (S, \*) forms   |  | | --- | | 1. A group | | 1. A ring | | 1. An integral domain | | 1. A field | |  |
| **14** | Which one of the following is NOT necessarily a property of a Group?   |  | | --- | | 1. Commutativity | | 1. Associativity | | 1. Existence of inverse for every element | | 1. Existence of identity | |  |
| **15** | For the composition table of a cyclic group shown below   |  |  |  |  |  | | --- | --- | --- | --- | --- | | \* | a | b | c | d | | a | a | b | c | d | | b | b | a | d | c | | c | c | d | b | a | | d | d | c | a | b |   Which one of the following choices is correct?   |  | | --- | | 1. a, b are generators | | 1. b, c are generators | | 1. c, d are generators | | 1. d, a are generators | |  |
| **16** | Let A = { 1,2,3,4,…….∞ } and a binary operation ‘+’ is defined by a + b = ab ∀ a,b ∈ A. Which of the following is true ?   |  | | --- | | 1. ( A, + ) is a semi group but not monoid | | 1. ( A, + ) is a monoid but not group | | 1. ( A, + ) is a group | | 1. ( A, + ) is not a semi group | |  |
| **17** | The set {1, 2, 3, 5, 7, 8, 9} under multiplication modulo 10 is not a group. Given below are four plausible reasons. Which one of them is false?   |  | | --- | | 1. It is not closed | | 1. 2 does not have an inverse | | 1. 3 does not have an inverse | | 1. 8 does not have an inverse | |  |
| **18** | Let G be a group with 15 elements. Let L be a subgroup of G. It is known that L != G and that the size of L is at least 4. The size of L is \_\_\_\_\_\_\_\_\_\_.   |  | | --- | | 1. 3 | | 1. 5 | | 1. 7 | | 1. 9 | |  |
| **19** | The set {1, 2, 4, 7, 8, 11, 13, 14} is a group under multiplication modulo 15. The inverses of 4 and 7 are respectively   |  | | --- | | 1. 3 and 13 | | 1. 2 and 11 | | 1. 4 and 13 | | 1. 8 and 14 | |  |
| **20** | Consider the set ∑\* of all strings over the alphabet ∑ = {0, 1}. ∑\* with the concatenation operator for strings   |  | | --- | | 1. does not form a group | | 1. forms a non-commutative group | | 1. does not have a right identity element | | 1. forms a group if the empty string is removed from ∑\* | |  |
| **21** | Which of the following is true?   |  | | --- | | 1. The set of all rational negative numbers forms a group under multiplication. | | 1. The set of all non-singular matrices forms a group under multiplication. | | 1. The set of all matrices forms a group under multiplication. | | 1. Both (2) and (3) are true. | |  |
| **22** | The binary operator ≠ is defined by the following truth g table  Which one of the following is true about the binary operator ≠?  [Q46](http://www.geeksforgeeks.org/wp-content/uploads/gq/2015/02/Q46.png)   |  | | --- | | 1. Both commutative and associative | | 1. Commutative but not associative | | 1. Not commutative but associative | | 1. Neither commutative nor associative | |  |
| **23** | Let*(Z, \*)*be an algebraic structure where Z is the set of integers and the operation ∗ is defined by *n ∗ m = max(n . m)*. Which of the following statements is true for *(Z, \*)*?   |  | | --- | | 1. (Z, \*) is a monoid | | 1. (Z, \*) is an Abelian group | | 1. (Z, \*) is a group | | 1. None of the above | |  |
| **24** | Which of the following statement is false?   |  | | --- | | 1. The set of rational numbers is an abelian group under addition | | 1. The set of integers in an abelian group under addition | | 1. The set of rational numbers form an abelian group under multiplication | | 1. The set of real numbers excluding zero is an abelian group under multiplication | |  |
| **25** | Which one of the following is false?   |  | | --- | | 1. The set of all bijective functions on a finite set forms a group under function composition. | | 1. The set {1, 2, ..................., p-1} forms a group under multiplication mod p where p is a prime number | | 1. The set of all strings over a finite alphabet ∑ forms a group under concatenation | | 1. A subset S≠∅ of G is a subgroup of the group if and only if for any pair of element a, b ∈ S, a∗b^−1 ∈ S | |  |
| **26** | Every cyclic group is a/an \_\_\_\_\_\_ a) infinite subgroup b) abelian group c) monoid d) commutative semigroup |  |
| **27** | The number of generators of cyclic group of order 219 is \_\_\_\_\_\_\_\_\_\_ a) 144 b) 124 c) 56 d) 218 |  |
| **28** | Let K be a group with 8 elements. Let H be a subgroup of K and H<K. It is known that the size of H is at least 3. The size of H is \_\_\_\_\_\_\_\_\_\_ a) 8 b) 2 c) 3 d) 4 |  |
| **29** | Intersection of subgroups is a \_\_\_\_\_\_\_\_\_\_\_ a) group b) subgroup c) semigroup d) cyclic group |  |
| **30** | A normal subgroup is \_\_\_\_\_\_\_\_\_\_\_\_ a) a subgroup under multiplication by the elements of the group b) an invariant under closure by the elements of that group c) a monoid with same number of elements of the original group d) an invariant equipped with conjugation by the elements of original group |  |

Answer

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1-A | 2-D | 3-C | 4-B | 5-A | 6-D | 7- A | 8-C | 9-C | 10-B |
| 11-B | 12-A | 13-A | 14-A | 15-C | 16-B | 17-C | 18-B | 19-C | 20-A |
| 21-B | 22-A | 23-D | 24-C | 25-C | 26-B | 27-A | 28-D | 29-B | 30-D |