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

**Department of Computer Science & Engineering**

**B.Tech CSE- III Semester**

**Set-3**

**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** | Let a set S = {2, 4, 8, 16, 32} and <= be the partial order defined by S <= R if a divides b. Number of edges in the Hasse diagram of is \_\_\_\_\_\_ a) 6 b) 5 c) 9 d) 4 | **CO3** |
| **2** | The less-than relation, <, on a set of real numbers is \_\_\_\_\_\_ a) not a partial ordering because it is not asymmetric and irreflexive equals anti-symmetric b) a partial ordering since it is asymmetric and reflexive c) a partial ordering since it is anti-symmetric and reflexive d) not a partial ordering because it is not anti-symmetric and reflexive | **CO3** |
| **3** | The inclusion of \_\_\_\_\_\_ sets into R = {{1, 2}, {1, 2, 3}, {1, 3, 5}, {1, 2, 4}, {1, 2, 3, 4, 5}} is necessary and sufficient to make R a complete lattice under the partial order defined by set containment. a) {1}, {2, 4} b) {1}, {1, 2, 3} c) {1} d) {1}, {1, 3}, {1, 2, 3, 4}, {1, 2, 3, 5} | **CO3** |
| **4** | Consider the ordering relation a | b ⊆ N x N over natural numbers N such that a | b if there exists c belong to N such that a\*c=b. Then \_\_\_\_\_\_\_\_\_\_\_ a) | is an equivalence relation b) It is a total order c) Every subset of N has an upper bound under | d) (N,|) is a lattice but not a complete lattice | **CO3** |
| **5** | A partial order ≤ is defined on the set S = {x, b1, b2, …bn, y} as x ≤ bi for all i and bi ≤ y for all i, where n ≥ 1. The number of total orders on the set S which contain the partial order ≤ is \_\_\_\_\_\_ a) n+4 b) n2 c) n! d) 3 | **CO3** |
| **6** | Let (A, ≤) be a partial order with two minimal elements a, b and a maximum element c. Let P:A –> {True, False} be a predicate defined on A. Suppose that P(a) = True, P(b) = False and P(a) ⇒ P(b) for all satisfying a ≤ b, where ⇒ stands for logical implication. Which of the following statements cannot be true? a) P(x) = True for all x S such that x ≠ b b) P(x) = False for all x ∈ S such that b ≤ x and x ≠ c c) P(x) = False for all x ∈ S such that x ≠ a and x ≠ c d) P(x) = False for all x ∈ S such that a ≤ x and b ≤ x | **CO3** |
| **7** | A Poset in which every pair of elements has both a least upper bound and a greatest lower bound is termed as \_\_\_\_\_\_\_ a) sublattice b) lattice c) trail d) walk | **CO3** |
| **8** | If every two elements of a poset are comparable then the poset is called \_\_\_\_\_\_\_\_ a) sub ordered poset b) totally ordered poset c) sub lattice d) semigroup | **CO3** |
| **9** | The graph given below is an example of \_\_\_\_\_\_\_\_\_ [discrete-mathematics-questions-answers-lattices-q6](https://www.sanfoundry.com/wp-content/uploads/2019/08/discrete-mathematics-questions-answers-lattices-q6.png) a) non-lattice poset b) semilattice c) partial lattice d) bounded lattice | **CO3** |
| **10** | Every poset that is a complete semilattice must always be a \_\_\_\_\_\_\_ a) sublattice b) complete lattice c) free lattice d) partial lattice | **CO3** |
| **11** | Consider the following Boolean expression.  F=(X+Y+Z)(X'+Y)(Y'+Z)  Which of the following Boolean expressions is/are equivalent to F' (complement of F)?   |  | | --- | | 1. (X'+Y'+Z')(X+Y')(Y+Z') | | 1. XY'+Z' | | 1. (X+Z')(Y'+Z') | | 1. XY'+YZ'+X'Y'Z' | |  |
| **12** | The following is the Hasse diagram of the poset [{a, b, c, d, e}, ≤][GATECS2005Q9](http://www.geeksforgeeks.org/wp-content/uploads/gq/2014/09/GATECS2005Q9.png)The poset is   |  | | --- | | 1. not a lattice | | 1. a lattice but not a distributive lattice | | 1. a distributive lattice but not a Boolean algebra | | 1. a Boolean algebra | |  |
| **13** | In a lattice defined by the Hasse diagram given in figure 3.3, how many complements does the element 'e' have? asd   |  | | --- | | 1. 2 | | 1. 3 | | 1. 0 | | 1. 1 | |  |
| **14** | A partial order ≤ is defined on the set *S= {x, a1, a2,.....an, y}* as *x < ai* for all*i* and *ai ≤ y* for all *i*, where n≥1. The number of total orders on the set S which contain the partial order ≤ is   |  | | --- | | 1. n! | | 1. n+2 | | 1. n | | 1. 1 | |  |
| **15** | Let X= {2, 3, 6, 12, 24}, Let ≤ be the partial order defined by X ≤ Y if x divides y. Number of edges in the Hasse diagram of (X,≤) is   |  | | --- | | 1. 3 | | 1. 4 | | 1. 9 | | 1. None of the above | |  |
| **16** | Consider the set  X={a,b,c,d,e}  under partial ordering  R={(a,a),(a,b),(a,c),(a,d),(a,e),(b,b),(b,c),(b,e),(c,c),(c,e),(d,d),(d,e),(e,e)}  The Hasse diagram of the partial order (X,R) is shown below.  https://gateoverflow.in/?qa=blob&qa_blobid=7716982195694840957  The minimum number of ordered pairs that need to be added to R to make (X,R) a lattice is \_\_\_\_\_\_   1. 0 2. 1 3. 2 4. 3 |  |
| **17** | Consider the following Hasse diagrams.   1. https://gateoverflow.in/?qa=blob&qa_blobid=13704456230339815073 2. https://gateoverflow.in/?qa=blob&qa_blobid=14549037313555261470 3. https://gateoverflow.in/?qa=blob&qa_blobid=2542191495641001674 4. https://gateoverflow.in/?qa=blob&qa_blobid=9889679979641374028   Which all of the above represent a lattice?   1. (i) and (iv) only 2. (ii) and (iii) only 3. (iii) only 4. (i), (ii) and (iv) only |  |
| **18** | The inclusion of which of the following sets into  S={{1,2},{1,2,3},{1,3,5},{1,2,4},{1,2,3,4,5}}  is necessary and sufficient to make S a complete lattice under the partial order defined by set containment?   1. {1} 2. {1},{2,3} 3. {1},{1,3} 4. {1},{1,3},{1,2,3,4},{1,2,3,5} |  |
| **19** | (A + B)(A’ \* B’) = ?  (A) 1  (B) 0  (C) AB  (D) AB’ |  |
| **20** | Complement of the expression A’B + CD’ is \_\_\_\_\_\_\_\_\_  Complement of the expression A’B + CD’ is \_\_\_\_\_\_\_\_\_  a) (A’ + B)(C’ + D)  b) (A + B’)(C’ + D)  c) (A’ + B)(C’ + D)  d) (A + B’)(C + D’) |  |
| **21** | There are \_\_\_\_\_\_\_\_\_ numbers of Boolean functions of degree n. a) n b) 22\*(n) c) n3 d) n(n\*2) |  |
| **22** | Evaluate the expression: (X + Z)(X + XZ’) + XY + Y. a) XY+Z’ b) Y+XZ’+Y’Z c) X’Z+Y d) X+Y |  |
| **23** | If an expression is given that x+x’y’z=x+y’z, find the minimal expression of the function F(x,y,z) = x+x’y’z+yz? a) y’ + z b) xz + y’ c) x + z d) x’ + y |  |
| **24** | Minimize the Boolean expression using Boolean identities: A′B+ABC′+BC’+AB′C′. a) B(AC)’ + AC’ b) AC’ + B’ c) ABC + B’ + C d) BC’ + A’B |  |
| **25** | Simplify the expression using K-maps: F(A,B,C,D)=Σ (1,3,5,6,7,11,13,14). a) AB+BC’D+A’B’C b) BCD’+A’C’D+BD’ c) A’D+BCD+A’BC+AB’C’ d) AC’D’+BC+A’BD+C’D’ |  |
| **26** | Simplify the expression using K-maps: F(A,B,C) = Σ (1,3,5,6,7). a) AC’+B’ b) AB+C c) AB’+B’C’ d) A’BC+B’C+AC |  |
| **27** | Use Karnaugh map to find the simplified expression of the function: F = x’yz + xy + xy’z’. a) xz’+y’z’ b) xy’z+xy c) y’z+x’y+z d) yz+xy+xy’z |  |
| **28** | Determine the number of essential prime implicants of the function f(a, b, c, d) = Σm(1, 3, 4, 8, 10, 13) + d(2, 5, 7, 12), where m denote the minterm and d denotes the don’t care condition. a) 23 b) 3 c) 643 d) 128 |  |
| **29** | How many number of prime implicants are there in the expression  F(x, y, z) = y’z’ + xy + x’z. a) 7 b) 19 c) 3 d) 53 |  |
| **30** | Determine the number of prime implicants of the following function F? **F(a, b, c, d) = Σm(1, 3, 7, 9, 10, 11, 13, 15)** a) 621 b) 187 c) 35 d) 5 |  |

Answer

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