United College of Engineering and Research, Allahabad

Department of Computer Science & Engineering

B.Tech CSE- III Semester

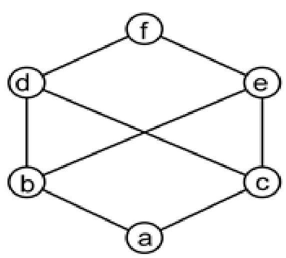
Set-3

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.**

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 $S = \{x, b_1, b_2, \ldots b_n, y\}$ as $x \leq b_i$ for all i and $b_i \leq y$ for all i, where $n \geq 1$. The number of total orders on the set S which contain the partial order ≤ is _______ a) n+4 b) n^2 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 __________  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 ________	**CO3**

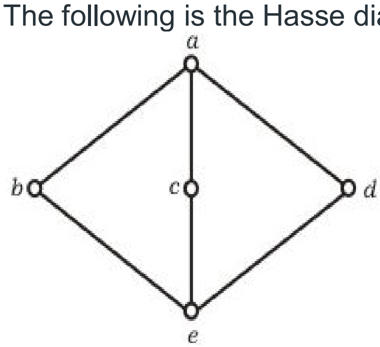
<table>
<tr><td></td><td>a) sublattice
b) complete lattice
c) free lattice
d) partial lattice</td><td></td></tr>
<tr><td>11</td><td>Consider the following Boolean expression.
F=(X+Y+Z)(X'+Y)(Y'+Z)

Which of the following Boolean expressions is/are equivalent to F' (complement of F)?

(A) (X'+Y'+Z')(X+Y')(Y+Z')

(B) XY'+Z'

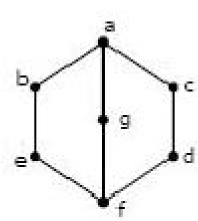
(C) (X+Z')(Y'+Z')

(D) XY'+YZ'+X'Y'Z'</td><td></td></tr>
<tr><td>12</td><td>The following is the Hasse diagram of the poset [{a, b, c, d, e}, ≤]


The poset is
(A) not a lattice

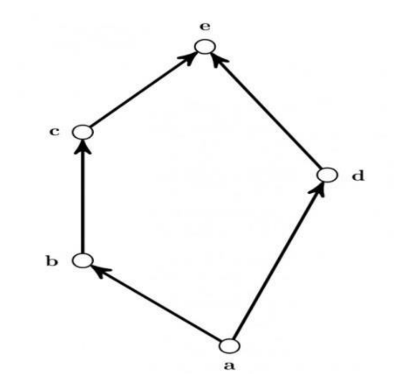
(B) a lattice but not a distributive lattice

(C) a distributive lattice but not a Boolean algebra

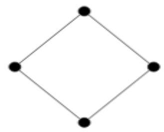
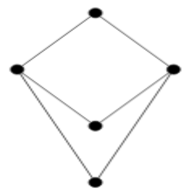
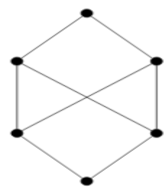
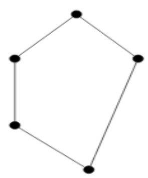
(D) a Boolean algebra</td><td></td></tr>
<tr><td>13</td><td>In a lattice defined by the Hasse diagram given in figure 3.3, how many


complements does the element 'e' have?
(A) 2

(B) 3</td><td></td></tr>
</table>

	(C) 0 (D) 1	
14	A partial order ≤ is defined on the set *S= {x, a_1, a_2,.....a_n, y}* as $x < a_i$ for all *i* and $a_i \le y$ for all *i*, where n≥1. The number of total orders on the set S which contain the partial order ≤ is (A) n! (B) n+2 (C) n (D) 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 (A) 3 (B) 4 (C) 9 (D) 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.  The minimum number of ordered pairs that need to be added to R to make (X,R) a lattice is ______ (A) 0 (B) 1 (C) 2 (D) 3	

<table>
<tr><td>17</td><td>Consider the following Hasse diagrams.

i. 
ii. 
iii. 
iv. 

Which all of the above represent a lattice?

A. (i) and (iv) only
B. (ii) and (iii) only
C. (iii) only
D. (i), (ii) and (iv) only</td><td></td></tr>
<tr><td>18</td><td>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?

A. {1}
B. {1},{2,3}
C. {1},{1,3}
D. {1},{1,3},{1,2,3,4},{1,2,3,5}</td><td></td></tr>
<tr><td>19</td><td>(A + B)(A’ * B’) = ?
(A) 1
(B) 0
(C) AB
(D) AB’</td><td></td></tr>
<tr><td>20</td><td>Complement of the expression A’B + CD’ is __________</td><td></td></tr>
</table>

	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) $2^{2*(n)}$ c) n^3 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) 2^3 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) 3^5 d) 5	

Answer

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