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

**Department of Computer Science & Engineering**

**IInd Sessional Examination (2017-18)**

**B.Tech. (IIIrd Semester)**

**Discrete Structures and Theory of Logic**

**Subject Code: KCS-303**

**Time:** 2.00 hours **Max. Marks:** 30

**Note:** There are three sections in this paper. All sections are compulsory.

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| **Question No.** | **Question** | **Marks** | **CO** | **Bloom’s level** |
| **Section-A** | | | | |
| 1 | Define totally ordered relation. | 10 | 3 | L1 |
| 2 | How many numbers of POSETs can be drawn for 3 elements? | 3 | L2 |
| 3 | Define least and greatest elements. | 3 | L1 |
| 4 | Define lattice. | 3 | L1 |
| 5 | Define Boolean algebra. | 3 | L1 |
| 6 | Define modular lattice. | 3 | L1 |
| 7 | Find the truth table of( P🡪Q)V(Q🡪R). | 4 | L2 |
| 8 | Define Universe of discourse in predicate calculus. | 4 | L1 |
| 9 | When set of premises are consistent? | 4 | L1 |
| 10 | What are the contrapositive, converse, and the inverse of the conditional statement “The home team wins whenever it is raining?” | 4 | L2 |
| **Section-B** | | | | |
| 1. **Attempt any three.** | | | | |
|  | Show that the inclusion relation ⊆ is a partial ordering on the power set of a set S. Draw the Hasse diagram for inclusion on the set P (S), where S = {a, b, c, d}. Also Determine whether (P (S), ⊆) is a lattice. | 2 | 3 | L3 |
|  | Show that the following are equivalent in a Boolean algebra  a ≤ b⇔ a\*b' = 0⇔b' ≤ a’ ⇔ a’⊕ b = 1 | 2 | 3 | L3 |
|  | Let (L,∨,∧,≤) be a distributive lattice and a, b∈ L . if a ∧ b = a ∧ c and  a ∨ b = a ∨ c then show that b = c | 2 | 3 | L3 |
|  | Find the sum-of-products and Product of sum expansion of the Boolean function F (x, y, z) = (x + y) z’. | 2 | 3 | L3 |
| 1. **Attempt any three.** | | | | |
|  | Show that ((P ∨Q) ∧¬( ¬ Q∨ ¬ R)) ∨ ( ¬ P∨ ¬ Q) ∨ ( ¬ P∨ ¬ R) is a tautology by using equivalences. | 2 | 4 | L3 |
|  | Obtain the principle disjunctive and conjunctive normal forms of the formula (￢p→r) ∧ (￢q↔ p) | 2 | 4 | L3 |
|  | Using indirect method of proof, derive p → ~s from the premises p → (q∨ r), q→ ~p, s→ ~r and p | 2 | 4 | L3 |
|  | What is a tautology, contradiction and contingency? Show that (p ∨ q) ∧ (¬ p ∨ r) → (q ∨ r) is a tautology, contradiction or contingency. | 2 | 4 | L2 |
| **Section-C** | | | | |
| 1. **Attempt any one.** | | | | |
|  | Answer these questions for the poset({3, 5, 9, 15,24, 45}, |).  i. Find the maximal elements. ii. Find the minimal elements.  iii. Is there a greatest element? iv. Is there a least element?  v. Find all upper bounds of {3, 5}.vi. Find the least upper bound of {3, 5}.  vii. Find all lower bounds of {15, 45}. viii.Find the greatest lower bound of {15, 45}, if it exists. | 4 | 3 | L4 |
|  | In a Lattice if a≤b≤c , then show that   1. a∨b=b∧c 2. (a∨b)∨(b∧c) = (a∨b) ∧ (a∨c) = b | 4 | 3 | L3 |
| 1. **Attempt any one.** | | | | |
|  | Prove the validity of the following argument:-  If I get the job and work hard then I will get promoted. If I will get promoted, then I will be happy. I will not be happy. Therefore I will not get the job or I will not work hard. | 4 | 4 | L3 |
|  | Show that the premises “It is not sunny this afternoon and it is colder than yesterday,” “We will go swimming only if it is sunny,” “If we do not go swimming, then we will take a canoe trip,” and “If we take a canoe trip, then we will be home by sunset” lead to the conclusion “We will be home by sunset.” | 4 | 4 | L3 |

**Bloom’s taxonomy level**  (1- Remembering, 2. Understanding, 3. Applying, 4. Analyzing, 5. Evaluating, 6. Creating)

**CO** -- Course Outcome