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

**Department of Computer Science & Engineering**

**IInd Sessional Examination (2018-19)**

**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 POSET. | 10 | 3 | L1 |
| 2 | Find the complements of all the elements of lattice D(30). | 3 | L2 |
| 3 | Define Boolean expression. | 3 | L1 |
| 4 | Define greatest lower bound. | 3 | L1 |
| 5 | Define complemented lattice. | 3 | L1 |
| 6 | Define distributive lattice. | 3 | L1 |
| 7 | Show that ¬ (p ∨ q) and ¬ p ∧ ¬ q are logically equivalent. | 4 | L2 |
| 8 | What are the contrapositive, converse, and the inverse of the conditional statement “The home team wins whenever it is raining?” | 4 | L2 |
| 9 | Differentiate between tautology and contradiction with suitable examples. | 4 | L1 |
| 10 | Express formula P🡪Q only in the terms of NAND connective. | 4 | L1 |
| **Section-B** | | | | |
| 1. **Attempt any three.** | | | | |
|  | Draw all the POSETs of 4 elements. | 2 | 3 | L3 |
|  | Draw the Hasse diagram of Poset ( {{1}, {2}, {4}, {1,2}, {1,4}, {2,4}, {3,4}, {1,3,4}, {2,3,4}}, ⊆ ) where composition is usual subset. | 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 |
|  | Show that in a distributive lattice, each elements have a unique complement. | 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 PCNF and PDNF of formula (~p ∨ ~q) → (p ↔~q) | 2 | 4 | L3 |
|  | Prove the validity of the following argument “if the races are fixed so the casinos are crooked, then the tourist trade will decline. If the tourist trade decreases, then the police will be happy. The police force is never happy. Therefore, the races are not fixed. | 2 | 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.” | 2 | 4 | L2 |
| **Section-C** | | | | |
| 1. **Attempt any one.** | | | | |
|  | Draw Karnaugh map and simplify the Boolean expression: - A’B’C’D’+ A’B C’ D + A’ B’ C D + A’B’C D’ + A’B C D | 4 | 3 | L4 |
|  | Let (A, ≤) and (B, ≤) be two posets. Prove that (A × B, ≤) is a poset, where (a, b) ≤ (c, d) if and only if a ≤ c, b ≤ d. | 4 | 3 | L3 |
| 1. **Attempt any one.** | | | | |
|  | Show that the following premises are inconsistent. (i) If Nirmala misses many classes through illness then he fails high school. (ii) If Nirmala fails high school, then he is uneducated. (iii) If Nirmala reads a lot of books then he is not uneducated. (iv) Nirmala misses many classes through illness and reads a lot of books. | 4 | 4 | L3 |
|  | Rewrite the following arguments using quantifiers, variables and predicate symbols.   1. All birds can fly. 2. Some men are genius. 3. Some numbers are not rational. 4. There is a student who likes mathematics but not geography. | 4 | 4 | L3 |

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

**CO** -- Course Outcome