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

**Department of Computer Science & Engineering**

**IInd Sessional Examination (2019-20)**

**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 a Partial Ordering. | 10 | 3 | L1 |
| 2 | Distinguish between bounded lattice and complemented lattice. | 3 | L2 |
| 3 | Define Boolean algebra. | 3 | L1 |
| 4 | Define least upper bound. | 3 | L1 |
| 5 | Define complemented lattice. | 3 | L1 |
| 6 | Define modular lattice. | 3 | L1 |
| 7 | Show that the propositions 𝑝→𝑞 𝑎𝑛𝑑 ¬𝑝∨𝑞 are logically equivalent. | 4 | L2 |
| 8 | Write the contra positive of the implication: “if it is Sunday then it is a holiday”. | 4 | L2 |
| 9 | Differentiate between tautology and contradiction with suitable examples. | 4 | L1 |
| 10 | Define modus ponens and modus tollens rules. | 4 | L1 |
| **Section-B** | | | | |
| 1. **Attempt any three.** | | | | |
|  | Prove that a lattice with 5 elements is not a Boolean algebra. | 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 values of the Boolean function represented by  F (x, y, z) = xy + 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 |
|  | 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 |
|  | Verify that the given propositions are tautology or not.   1. p ∨￢ (p ∧q) 2. ￢p ∧q | 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 |
|  | 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