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

**Department of Computer Science & Engineering**

**IIIrd 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 equivalence class. | 10 | 1 | L1 |
| 2 | Determine the power set P(A) of A = {a, b, c, d}. | 1 | L2 |
| 3 | Define group homomorphism and isomorphism. | 2 | L1 |
| 4 | Define Boolean algebra. | 3 | L1 |
| 5 | Define complemented lattice. | 3 | L1 |
| 6 | Write the contra positive of the implication: “if it is Sunday then it is a holiday”. | 4 | L2 |
| 7 | Show that the propositions 𝑝→𝑞 𝑎𝑛𝑑 ¬𝑝∨𝑞 are logically equivalent. | 4 | L2 |
| 8 | Define Pigeon-hole principle. | 5 | L1 |
| 9 | What is a binary Search tree? Explain with example. | 5 | L1 |
| 10 | Obtain the generating function for the sequence 4, 4, 4, 4, 4, 4, 4. | 5 | L2 |
| **Section-B** | | | | |
| 1. **Attempt any three.** | | | | |
|  | Find the numbers between 1 to 500 that are not divisible by any of the integers 2 or 3 or 5 or 7. | 2 | 1 | L4 |
|  | Is the “divides” relation on the set of positive integers transitive? What is the reflexive and symmetric closure of the relation?  R = {(a, b) | a > b} on the set of positive integers? | 2 | 1 | L3 |
|  | Let Z be the group of integers with binary operation \* defined by  a\*b = a + b − 2, for all a, b∈ Z . Find the identity element of the group (Z,\*). | 2 | 2 | L3 |
|  | Show that every cyclic group is abelian. | 2 | 2 | L2 |
| 1. **Attempt any three.** | | | | |
|  | 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 |
|  | Prove the validity of the following argument “if the races are fixed or 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 |
|  | Consider the group G = {1, 2, 3, 4, 5, 6} under multiplication modulo 7.  (i) Find the multiplication table of G. (ii) Find 2−1, 3−1, 6−1.  (iii) Find the orders and subgroups generated by 2 and 3. (iv) Is G cyclic? | 4 | 2 | L3 |
| 1. **Attempt any one.** | | | | |
|  | Define preorder, inorder and postorder tree traversal. Give an example of preorder, postorder & inorder traversal of a binary tree of your choice with at least 12 vertices. | 4 | 5 | L4 |
|  | Solve the recurrence relation by the method of generating function.  ar-7ar-1+10ar-2 = 0, r≥2, Given a0=3 and a1=3. | 4 | 5 | L4 |

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

**CO** -- Course Outcome