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

**Department of Computer Science & Engineering**

**Ist 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 Multiset and Power set. | 10 | 1 | L1 |
| 2 | Determine the power set P(A) of A = {a, b, c, d}. | 1 | L2 |
| 3 | Define equivalence class. | 1 | L1 |
| 4 | Define reflexive closure. | 1 | L1 |
| 5 | Define function. | 1 | L1 |
| 6 | Define abelian group. | 2 | L1 |
| 7 | Define cyclic group. | 2 | L1 |
| 8 | Define group homomorphism and isomorphism. | 2 | L1 |
| 9 | What is Lagrange theorem? | 2 | L1 |
| 10 | Define Field. | 2 | L1 |
| **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 | 2 | 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 | 2 | L3 |
|  | How many symmetric and reflexive relations are possible from a set A containing ‘n’ elements? | 2 | 2 | L3 |
|  | Prove that +++……………..+ > for n ≥ 2 using principle of mathematical induction | 2 | 2 | L3 |
| 1. **Attempt any three.** | | | | |
|  | 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 | 1 | L3 |
|  | Show that every cyclic group is abelian. | 2 | 1 | L2 |
|  | What do you mean by cosets of a subgroup? Consider the group Z of integers under addition and the subgroup H = {…., -12, -6, 0, 6 12, ……} considering of multiple of 6   1. Find the cosets of H in Z 2. What is the index of H in Z. | 2 | 1 | L3 |
|  | What is Ring? Define elementary properties of Ring with example. | 2 | 1 | L2 |
| **Section-C** | | | | |
| 1. **Attempt any one.** | | | | |
|  | Let f: X→Y and X=Y=R, the set of real number. Find f-1 if   1. fr(x)=x2 2. f(x)=(2x-1)/5 | 4 | 1 | L4 |
|  | Let R be a relation on R, the set of real numbers, such that  R={(x,y)│׀x-y׀<1}. Is R an equivalence relation? Justify. | 4 | 1 | L4 |
| 1. **Attempt any one.** | | | | |
|  | 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 |
|  | Prove that (R,+,\*) is a ring with zero divisors, where R is 2x2 matrix and + and \* are usual addition and multiplication operations. | 4 | 2 | L3 |

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

**CO** -- Course Outcome