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

**Department of Computer Science & Engineering**

**Ist 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 Multiset and Power set. | 10 | 1 | L1 |
| 2 | Find all the functions defined on the set S={1,2,3}. | 1 | L2 |
| 3 | Define equivalence relation. | 1 | L1 |
| 4 | Define transitive closure. | 1 | L1 |
| 5 | Define into function. | 1 | L1 |
| 6 | Define normal subgroup. | 2 | L1 |
| 7 | Define order of an elements in a group. | 2 | L1 |
| 8 | Define group isomorphism. | 2 | L1 |
| 9 | What is Lagrange theorem? | 2 | L1 |
| 10 | Define Boolean ring. | 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 |
|  | Suppose S and T are two sets and f is a function from S to T. Let R1 be an equivalence relation on T. Let R2 be a binary relation on S such that (x,y) ∈ R2 if and only if (f(x), f(y)) ∈ R1. Show that R2 is also an equivalence relation. | 2 | 2 | L3 |
|  | Find all the partitions of set S={a,b,c,d}. | 2 | 2 | L3 |
|  | Let f:R🡪R and g: R🡪R, where R is the set of real numbers. Find fog and gof, where f(x) =x2-2 and g(x) =x+4. State whether these functions are injective, surjective and bijective. | 2 | 2 | L3 |
| 1. **Attempt any three.** | | | | |
|  | Find all the subgroups of <Z12, +12>. | 2 | 1 | L3 |
|  | Show that every cyclic group is abelian. | 2 | 1 | L2 |
|  | If G is a group of order n then order of any element a ∈ G is a factor of n. Prove this. | 2 | 1 | L3 |
|  | What is Ring? Define elementary properties of Ring with example. | 2 | 1 | L2 |
| **Section-C** | | | | |
| 1. **Attempt any one.** | | | | |
|  | Find all the equivalence relations defined on the set S={1,2,3,4}. | 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.** | | | | |
|  | Define **normal subgroup**. Prove that a subgroup H of a group G is said to be normal iff g-1hg ∈ H, for every h ∈ H, g ∈ G. | 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