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

**Department of Computer Science & Engineering**

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

**B.Tech. (IIIrd Semester)**

**Discrete Structures and Theory of Logic**

**Subject Code: RCS-301**

**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 anti-symmetric relation. | 10 | 1 | L1 |
| 2 | Find all the equivalence relations defined on set S = {a,b,c}. | 1 | L2 |
| 3 | Define equivalence class. | 1 | L1 |
| 4 | Define symmetric closure. | 1 | L1 |
| 5 | Define onto function. | 1 | L1 |
| 6 | Define subgroup group. | 2 | L1 |
| 7 | Define Boolean ring. | 2 | L1 |
| 8 | Define group homomorphism and isomorphism. | 2 | L1 |
| 9 | What is Lagrange theorem? | 2 | L1 |
| 10 | Define Ring. | 2 | L1 |
| **Section-B** | | | | |
| 1. **Attempt any three.** | | | | |
|  | Show that A X (B∩C) = (A X B) ∩ (A X C). | 2 | 2 | L4 |
|  | Prove that the relation “congruence modulo m” given by  R = {(x,y) | x-y is divisible by m}  Over the set of positive integers is an equivalence relation. Show also that if x1 R y1 and x2 R y2, then (x1+y1) R (x2+y2) | 2 | 2 | L3 |
|  | How many symmetric and reflexive relations are possible from a set A containing ‘n’ elements? | 2 | 2 | L3 |
|  | Prove that for any integer n ≥0,  1+2+22+23+………………..+ 2n = 2n+1 - 1 | 2 | 2 | L3 |
| 1. **Attempt any three.** | | | | |
|  | Let G1 and G2 be the subgroup of a group G.   1. Show that G1 ∩ G2 is also a subgroup of G. 2. Is G1UG2 always a subgroup of G? | 2 | 1 | L3 |
|  | Show that every cyclic group of order n is isomorphic to the group <Zn, +n>. | 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.** | | | | |
|  | How many functions are there from X to Y for the sets given below? Find also the number of functions, which are one-to-one, onto and one-to-one onto.   * + 1. X = {1,2,3,4} Y={1,2,3,4}     2. X = {1,2,3,4,5} Y={1,2,3}     3. X = {1,2,3} Y={1,2,3,4,5} | 4 | 1 | L4 |
|  | Define the primitive recursive function. Show that if f(x,y) defines the remainder upondivision of y by x, then it is a primitive recursive function. | 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 |
|  | Find all the subgroups of   1. <Z12, +12> 2. <Z\*7, x7>, where Z\*7 = Z7 - {[0]}. | 4 | 2 | L3 |

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

**CO** -- Course Outcome