**United Group of Institution**

**Department of Computer Science and Information Technology**

**Ist Sessional Examination (2020-21)**

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

**Discrete Structure 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 function. | | 10 | 1 | L1 |
| 2 | Define equivalence relation. | | 1 | L1 |
| 3 | Define the order of an element in a Group. | | 2 | L1 |
| 4 | State Lagrange theorem. | | 2 | L1 |
| 5 | Define cyclic group. | | 2 | L1 |
| 6 | What is the possible number of reflexive relations on a set of 5 elements? | | 1 | L2 |
| 7 | Let E, F and G be finite sets.  Let X = (E ∩F) - (F∩G) and Y = (E- (E∩G)) - (E- F)  Which one of the following is true?   1. X⊂ Y (B) X⊃Y (C) X ≠ Y (D) X-Y ≠ ϕ and Y-X ≠ ϕ | | 1 | L2 |
| 8 | Let S be a set of n elements. The number of ordered pairs in the largest and the smallest equivalence relations on S are   1. n and n (B) n2 and n (C) n2 and 0 (D) n and 1 | | 1 | L2 |
| 9 | How many onto functions are there from the set of n elements to a set of 2 elements?   1. 2n (B) 2n-1 (C) 2n-2 (D) 2(2n-2) | | 1 | L2 |
| 10 | The set {1, 2, 4, 7, 8, 11, 13, 14} is a group under multiplication modulo 15. The inverse of 4 and 7 are respectively:   1. 3 and 13 (B) 2 and 11 (C) 4 and 13 (D) 8 and 14 | | 2 | L3 |
| **Section-B** | | | | | |
| 1. **Attempt any three.** | | | | | |
|  | | How many symmetric and reflexive relations are possible from a set A containing ‘n’ elements? | 2 | 1 | L2 |
|  | | Prove that +++……………..+ > for n ≥ 2 using principle of mathematical induction | 2 | 1 | L3 |
|  | | 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 |
|  | | 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. | 2 | 1 | L3 |
| 1. **Attempt any three.** | | | | | |
|  | | Show that every cyclic group is abelian. | 2 | 2 | L2 |
|  | | Let (G,\*) be a group, where \* is usual multiplication operation on G. Show that for any a, b ϵ G,  i. (a-1)-1 = a  ii. (ab)-1 = b-1a-1 | 2 | 2 | L3 |
|  | | Let G={1,-1,i,-i} be the multiplicative group, where i=   1. Determine whether G is an abelian. 2. If G is a cyclic group, then determine generator of G. | 2 | 2 | L3 |
|  | | Prove that intersection of two subgroups is also a subgroup. | 2 | 2 | L3 |
| **Section-C** | | | | | |
| 1. **Attempt any one.** | | | | | |
|  | | Prove by using mathematical induction that:  7+77+777+............+777...........7=7/81[10n+1-9n-10] for every n ϵ N. | 4 | 1 | L4 |
|  | | (a) 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.  (i) X = {1,2,3,4} Y={1,2,3,4}  (ii) X = {1,2,3,4,5} Y={1,2,3}  (iii) X = {1,2,3} Y={1,2,3,4,5} | 4 | 1 | L4 |
| 1. **Attempt any one.** | | | | | |
|  | | Show that a subgroup H of G is normal subgroup iff g-1hg ∈ H, ∀ h ∈ H and g ∈ G. | 4 | 2 | L4 |
|  | | Consider G={1,5,7,11,13,17} under multiplication modulo 18.  (i) Find 5-1, 7-1 and (17)-1.  (ii) Find the order of 5 and 13.  (iii) Is G cyclic? | 4 | 2 | L4 |

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

**CO** -- Course Outcome