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

**Department of Computer Science & Engineering**

**1st  Sessional Examination, 2021-22**

**B.Tech. (3rd 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.**

**Section-A**

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| **S. No.** | **Note:** All questions are **compulsory**. Each question has equal marks. **10\*1=10** | **Mark** | **BL** | **CO** |
| 1.a. | If a power set of a set contains **log n** elements then what is the elements in that set? | 1 | L2 | CO1 |
| 1.b. | If there is a function from X🡪Y and set X and Y has m and n elements then what will be the number of onto functions from X to Y. | 1 | L2 | CO2 |
| 1.c. | Explain the difference between relation and function. | 1 | L2 | CO1 |
| 1.d. | Define symmetric and anti-symmetric relation. | 1 | L1 | CO1 |
| 1.e. | Define transitive closure of a relation. | 1 | L1 | CO1 |
| 1.f. | If a set has 6 elements then how many reflexive relation exists? | 1 | L2 | CO1 |
| 1.g. | Let A and B be sets. Show that AXB≠ BXA. Under what condition AXB=BXA? | 1 | L2 | CO1 |
| 1.h. | Let S be a set of n elements. Then, what are the number of ordered pairs in the largest and the smallest equivalence relation? | 1 | L2 | CO1 |
| 1.i. | Let A, B and C is three sets with elements l, m and n respectively. Let X = AxB and E be the set of all the subsets of X. Then, find the number of functions from C to E. | 1 | L2 | CO1 |
| 1.j. | If a set has 3 elements, then how many equivalence relations exist on that set? | 1 | L2 | CO1 |

**Section-B**

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| **S. No.** | **Note:** Attempt any **three** questions. Each question has equal marks. **3\*4=12** | **Mark** | **BL** | **CO** |
| 2. | 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? | 4 | L3 | CO2 |
| 3. | Find the numbers between 1 to 500 that are not divisible by any of the integers 2 or 3 or 5 or 7. | 4 | L3 | CO2 |
| 4. | Prove that +++……………..+>for n ≥ 2 using principle of mathematical induction | 4 | L3 | CO2 |
| 5. | For each of these relations on the set {1, 2, 3, 4}, decide whether it is reflexive, whether it is symmetric, whether it is anti-symmetric, and whether it is transitive   1. {(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)} 2. {(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)} 3. {(2, 4), (4, 2)} 4. {(1, 2), (2, 3), (3, 4)} 5. {(1, 1), (2, 2), (3, 3), (4, 4)} 6. {(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)} | 4 | L4 | CO1 |

**Section-C**

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| **S. No.** | **Note:** Attempt any **one** questions. Each question has equal marks. **1\*8=8** | **Mark** | **BL** | **CO** |
| 6. | (a) Prove by using mathematical induction that:  7+77+777+............+777...........7=7/81[10n+1-9n-10] for every n ϵ N.  (b) Show that  (i) A-B = A∩B'  (ii) A ⊆ B ⇔ B' ⊆ A' | 8 | L4 | CO2 |
| 7. | (a) How many functions are there from X to Y for the sets given below? Find also the number of functions which are one-one, onto and bijective.  (i) X = { 1, 2, 3, 4, 5 }, Y = { 1, 2, 3 }  (ii) X = { 1, 2, 3 }, Y = {1, 2, 3, 4, 5 }  (b) Let R denote a relation on the set of ordered pairs of positive  integers such that  (x, y) R (u, v) iff xv = yu.  Show that R is an equivalence relation. | 8 | L4 | CO2 |