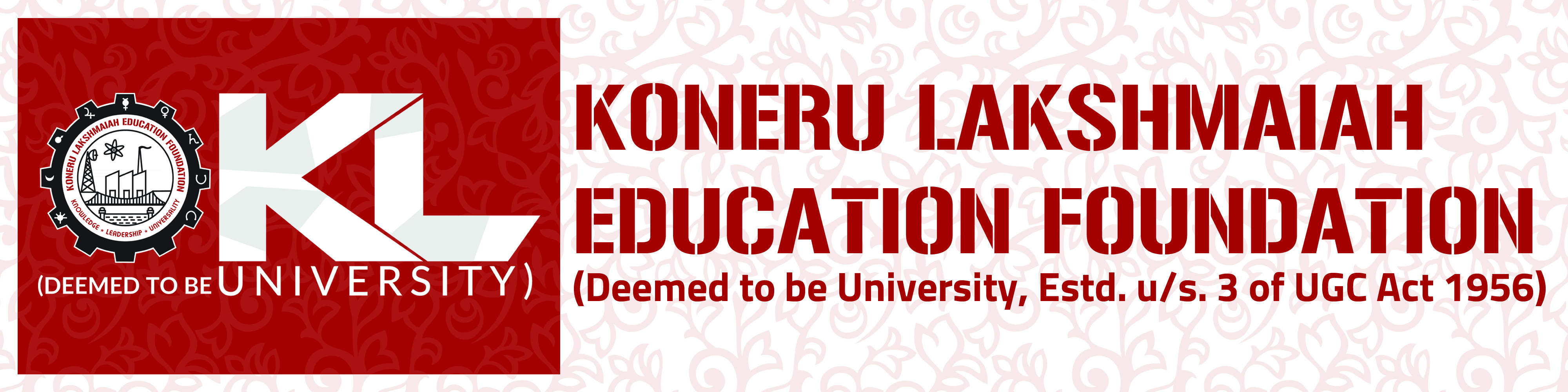
**D30**



**I/IV-B.Tech-(ODD Sem), Academic Year: 2023-2024**

**B. Tech. (AIDS,CSE,CSIT,ECE), 2023 Batch I/IV, ODD Semester**

**Subject Code: 23MT1002**

**TITLE: Discrete Structures**

**CO-1: CLASSROOM DELIVARY PROBLEMS**

**Session-1**

1. Let S be a set of consisting of 10 elements. Find the number of tuples of the form (A,B) such that A and B are subsets of S, and A⊆B  (**GATE2021)**
2. In a group of 60 people, 27 like cold drinks and 42 like hot drinks and each person likes at least one of the two drinks. Identify the number of people like both the drinks?
3. There are 35 students in art class and 57 students in dance class. Find the number of students who are either in art class or in dance class.
   * + - 1. When two classes meet at different hours and 12 students are enrolled in both activities.
         2. When two classes meet at the same hour.
4. In a group of 100 persons, 72 people can speak English and 43 can speak French. How many can speak English only? How many can speak French only and how many can speak both English and French?
5. In a competition, a school awarded medals in different categories. 36 medals in dance, 12 medals in dramatics and 18 medals in music. If these medals went to a total of 45 persons and only 4 persons got medals in all the three categories, how many received medals in exactly two of these categories?
6. Out of 30 students in a hostel. 15 study History and 8 study Economics and 6 study Geography. It is known that 3 students study all these subjects. Show that 7 or more students study none of these subjects.
7. In a class of 100 students, 35 like science and 45 like math. 10 like both. How many like either of them and how many like neither?
8. There are 30 students in a class. Among them, 8 students are learning both English and French. A total of 18 students are learning English. If every student is learning at least one language, how many students are learning French in total?
9. Among 50 patients admitted to a hospital, 25 are diagnosed with pneumonia, 30 with bronchitis, and 10 with both pneumonia and bronchitis. Determine:

(a) The number of patients diagnosed with pneumonia or bronchitis (or both).

(b) The number of patients not diagnosed with pneumonia or bronchitis.

1. In a class of 60 students, 40 students like math, 36 like science, 24 like both the subjects. Find the number of students who like(i) Math only, (ii) Science only  (iii) Either Math or Science (iv) Neither Math nor science.

**Session-2**

* + 1. For given two sets P and Q, n(P – Q) = 24, n(Q – P) = 19 and n(P ∩ Q) = 11, find n (P ∪ Q

)

* + 1. Draw the Venn diagram of A ∩ BC
    2. If U = {1,2,3,4,5,6,7,8}, A = {1,2,3}, B = {3,4,5,6}, C = {3,4,8}, sketch A-(B U C) Venn diagram
    3. In a food joint, we have our all-time favorite food: pizza, macaroni, sandwich, and burger. Evaluate the number of different ways can we have them? Also write all these types.
    4. Given the set of Boolean variables: S = {A, B, C}, please create the truth table that encompasses all conceivable combinations of values for these variables.
    5. In a survey of 500 students of a University, it is observed that 49% interested watching football, 53% liked watching hockey and 62% interested watching basketball. Further 27% interested watching football and hockey both, 29% liked watching basketball and hockey both and 28% interested watching football and basketball both. 5% liked watching none of these games.

1. How many students like watching all these games?
2. Find the number of students who like watching only one of the three games.
3. Determine the number of students who like watching at least two of the given games.

* + 1. Among a group of students, 50 played cricket, 50 played hockey and 40 played volley ball. 15 played both cricket and hockey, 20 played both hockey and volley ball, 15 played cricket and volley ball and 10 played all three. If every student played at least one game, find the number of students and how many played only cricket, only hockey and only volleyball?

**Session-3**

* + 1. A sample of 100 AND gates in ASIC(Application specific integrated circuit), A, B and C are the subsets of these 100 gates having defects D1,D2 and D3 respectively. Also n(A) =23, n(B) =26, n(C) =30, n(AB) =7, n(AC)=8, n(BC) =10 and n(ABC)=3. How many gates in the sample have at least one of the defectsD1, D2, D3?
    2. Among the integers between 1 and 200 find the number of integers that are divisible by either of 2,3 or 5
    3. Among the integers between 1 and 200 find the number of integers that are divisible by either of 2 or 5 or 9
    4. Among the integers between 1 and 200 find the number of integers that are not divisible by either of 2 or 5 or 9
    5. Among the integers between 1 and 200 find the number of integers that are divisible by 5 or not by 2 or 9

**Session-4**

1. If and the functions and are defined by

and , then find if they exist.

1. . If   and , then find  and .
2. Let *A*= {1, 2, 3, 4} and *B*= **N** Let *f*: *A*→ *B* be defined by *f*(*x*) = *x*3 then,

(i) find the range of *f*

(ii) identify the type of function

1. The function between real numbers in the interval [0, 1) and real numbers in the interval (0, 1) defined by f: [0, 1) to (0, 1) such that f(x)= x / (1 - x) then verify f(x) is Bijective function or not is so find its inverse
2. If be defined by f(x) = x/(x-3), where A=R-{3} show that f is bijective and hence find f-1

**Session-5**

1. Let m be a positive integer. A relation R is defined on the set Z by “aRb if and only if a – b is divisible by m” for a, b ∈ Z. Show that R is an equivalence relation on set Z.
2. If A = {1, 2, 3, 4}, give an example of a relation that is

i) reflexive and symmetric, but not transitive

ii) reflexive and transitive, but not symmetric, and

iii) symmetric and transitive, but not reflexive.

1. A set of integers, a relation R is defined by xRy if and only if x-y is divisible by 4, then verify R is an equivalence relation.
2. Examine that the relation R is an equivalence relation in the set

A = { 1, 2, 3, 4, 5 } given by the relation R = { (a, b)/|a-b| is even }.

1. Show that the inclusion relation “⊆” is a partial ordering on the power set of a set S.
2. Verify that the relation “ ≤ ” is a partial ordering on Z .

**Session-6&7**

* + 1. Draw the Hasse diagram using the relation, “Set inclusion” on the set P (S), where S = {a, b, c, d}.
    2. Draw Hasse diagram for (D12, /)
    3. Construct the Hasse diagram for ({1, 2, 4, 8, 16, 32, 64}, “≤”).
    4. Verify that the relation “<” is a partial ordering on Natural number set N.
    5. Different type Functions for Computer Science (Ceiling Function, Floor Function, Boolean Function, Exponential Function)

5. Evaluate the following values

a)

b)

c)

d)

e)

6. Evaluate the ceiling function of 4.5 and – 4.5. Also, explain the answer with the help of graph.