

**COMSATS University, Islamabad**

**Islamabad Campus**

**Department of Computer Science**

|  |  |
| --- | --- |
| **Assignment No. 02** | |
| **Course code and Title:** CSC102, DISCRETE STRUCTURES | |
| **Instructor: Mr Khurram Iqbal** | **Class:** BSSE 1A |
| **Assigned Date: October 12, 2024** | **Due Date: October 25, 2024** |
| **CLO-3:** Perform the operations associated with sets, functions, and relations. | |
| **Instructions: (Read before Attempt)**   1. This is an individual assignment. You will submit your work individually through your MS Teams account 2. Try to get the concepts, consolidate your concepts and ideas from these questions. 3. You should concern **recommended books** for clarify your concepts as handouts are not sufficient. 4. **Try to make solution by yourself and protect your work from other students. If I found the solution files of some students are same then I will reward zero marks to all those students.** 5. The deadline for this assignment is **October 25, 2024.** This deadline will not be extended. | |

|  |
| --- |
| **SET** |
| **Question # 1** |
| The Venn diagram shows the elements in the set A, B and C.    Write down the elements in each of the following sets.   1. b) c) d) e) |
| **Question # 2** |
| 1. Given that U= {*x*: *x* is an integer less than 22}, A= {*x*: x is a prime number less than 20} and   B= {*x*; a <c<b}, find two pairs of values of a and b so that A ∩ B= ϕ   1. U={ x :x is an integer, 0 ≤ x < 12}   A={x ; X(x-5)=0}  B={x:   1. Draw a Venn diagram to illustrate above information. 2. List the elements of 3. A B 4. A ∪ B’ |
| **Question # 3** |
| A cricket club has 120 members, U is the set of all the boys who play cricket. X is the set of batsmen. Y is the set of bowlers. The letters a, b and c in the Venn Diagram below represent the number of members in each subset of X and y. the letter d represents the number of members who are neither batsmen nor bowlers. Given that n(U)=120, n(X)= 80 and n(Y)=48, find   1. The value of b if d=0 2. The value of d if b=c 3. The largest possible n umber of member who are neither batsman nor bowlers. |
| **Question # 4** |
| It is given that U={ x : x is a real number , -15 ≤ x ≤ 15}, A={ x : --15 ≤ x ≤ 15}, B={x : 5 ≤ x ≤ 15}, C={x : -10 ≤ x ≤ 10} and D= {x : -15 ≤ x ≤ 8}  Write expression for the following, illustrating each solution on number line.   1. A’ 2. B ∩ C 3. C ∩ D 4. B ∪ D 5. B ∩ D’ |
| **Question # 5** |
| 68 elderly men failed a medical test because of defects in at least one of these organs: the heart, lungs and Kidney. 30 heart disease, 30 lung disease and 33 kidney disease. 7 of them had both lung and heart diseases, 10 had lung and kidney and lung disease while 11 had kidney and heart diseases. Draw a Venn diagram to illustrate this information. Find the number of elderly men:   1. Who suffered from all three diseases, 2. Had only lung disease |
| **RELATION** |
| **Question # 6** |
| **Do as directed:**   1. Represent the following relations using 2. Arrow Diagram 3. Digraph. 4. Matrix 5. The relation *R* = {(1, 2), (2, 3), (3, 4), (4, 1)} on {1, 2, 3, 4} 6. The relation *R*={(1, 2), (2, 1), (3, 3), (1, 1), (2, 2)} on *X* = {1, 2, 3} 7. The relation *R* on {1, 2, 3, 4} defined by (*x*, *y*) ∈ *R* if *x*2 ≥ *y* 8. Write the following relations represented by digraph 9. as a set of ordered pairs 10. as a Matrix  |  |  |  | | --- | --- | --- | |  |  |  |  1. Write the relation R, given by the matrix, as a set of ordered pairs. Also Find Domain and Range of each relations  |  |  |  | | --- | --- | --- | |  |  |  |  1. Complete each matrix of a relation on {a, b, c} in such a way that the relation has the given property.     , reflexive   |  |  |  | | --- | --- | --- | | **-** | **1** | **0** | | **0** | **-** | **1** | | **1** | **0** | **-** |   , symmetric   |  |  |  | | --- | --- | --- | | **1** | **-** | **0** | | **1** | **0** | **1** | | **-** | **-** | **1** |   , transitive   |  |  |  | | --- | --- | --- | | **-** | **1** | **-** | | **-** | **1** | **1** | | **1** | **-** | **-** |  1. Let R1 and R2 be the relations on {1, 2, 3, 4} given by   R1 = {(1, 1), (1, 2), (3, 4), (4, 2)}  R2 = {(1, 1), (2, 1), (3, 1), (4, 4), (2, 2)}.  List the elements of:   1. R1 R2 2. R1  R2 3. R1 ◦ R2 4. R2 ◦ R1. |
| **Question # 7** |
| Let X be the set of all four-bit strings (e.g., 0011, 0101, 1000). Define a relation R on X as s1 Rs2 if some substring of s1 of length 2 is equal to some substring of s2 of length 2. Examples: 0111 R 1010 (because both 0111 and 1010 contain 01). 1110 ̸R 0001 (because 1110 and 0001 do not share a common substring of length 2). Is this relation reflexive, symmetric, transitive? |
| **Question # 8** |
| Let X ={1, 2, 3, 4, 5}, Y ={3, 4}, and C= {1, 3}. Define the relation R on P(X), the set of all subsets of X, as  ARB if A ∪ Y = B ∪ Y.   1. List the elements of R 2. Show that R is an equivalence relation. |
| **Question # 9** |
| Consider the set T of tasks that must be completed in order to take an indoor flash picture with a particular camera.  1. Remove lens cap.  2. Focus camera.  3. Turn off safety lock.  4. Turn on flash unit.  5. Push photo button.  Some of these tasks must be done before others. For example, task 1 must be done before task 2. On the other hand, other tasks can be done in either order. For example, tasks 2 and 3 can be done in either order.  The relation R defined on T by  i R j if i = j or task i must be done before task j  Show that R is a partial order. |