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

**Department of Computer Science & Engineering**

**B.Tech CSE- III Semester**

**Set-1**

**Course Name:** Discrete Structure and Theory of Logic **AKTU Course Code:** KCS-303

**Time: 60 Minutes Max. Marks: 30**

* **All Questions are compulsory.**
* **All Questions carry one mark.**

|  |  |  |
| --- | --- | --- |
| **Q. No.** | **Questions** | **CO** |
| **1** | Power set of empty set has exactly \_\_\_\_\_\_\_\_\_ subset. (A) One (B) Two (C) Zero (D) Three | **CO1** |
| **2** | What is the Cardinality of the Power set of the set {0, 1, 2}? a) 8 b) 6 c) 7 d) 9 | **CO1** |
| **3** | Two sets are called disjoint if there \_\_\_\_\_\_\_\_\_\_\_\_\_ is the empty set. a) Union b) Difference c) Intersection d) Complement | **CO1** |
| **4** | The binary relation {(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)} on the set {1, 2, 3} is \_\_\_\_\_\_\_\_\_\_ a) reflective, symmetric and transitive b) irreflexive, symmetric and transitive c) neither reflective, nor irreflexive but transitive d) irreflexive and antisymmetric | **CO1** |
| **5** | Let S be a set of n>0 elements. Let be the number Br of binary relations on S and let Bf be the number of functions from S to S. The expression for Br and Bf, in terms of n should be \_\_\_\_\_\_\_\_\_\_\_\_ a) n2 and 2(n+1)2 b) n3 and n(n+1) c) n and n(n+6) d) 2(n\*n) and nn | **CO1** |
| **6** | Consider the binary relation, A = {(a,b) | b = a – 1 and a, b belong to {1, 2, 3}}. The reflexive transitive closure of A is? a) {(a,b) | a >= b and a, b belong to {1, 2, 3}} b) {(a,b) | a > b and a, b belong to {1, 2, 3}} c) {(a,b) | a <= b and a, b belong to {1, 2, 3}} d) {(a,b) | a = b and a, b belong to {1, 2, 3}} | **CO1** |
| **7** | Let A and B be two non-empty relations on a set S. Which of the following statements is false? a) A and B are transitive ⇒ A∩B is transitive b) A and B are symmetric ⇒ A∪B is symmetric c) A and B are transitive ⇒ A∪B is not transitive d) A and B are reflexive ⇒ A∩B is reflexive | **CO1** |
| **8** | The inverse of function f(x) = x3 + 2 is \_\_\_\_\_\_\_\_\_\_\_\_ a) f-1(y) = (y – 2)1/2 b) f-1(y) = (y – 2)1/3 c) f-1(y) = (y)1/3 d) f-1(y) = (y – 2)L | **CO1** |
| **9** | The function f(x) = x3 is bijection from R to R. Is it True or False? a) True b) False | **CO1** |
| **10** | Let f and g be the function from the set of integers to itself, defined by f(x) = 2x + 1 and g(x) = 3x + 4. Then the composition of f and g is \_\_\_\_\_\_\_\_\_\_\_\_ a) 6x + 9 b) 6x + 7 c) 6x + 6 d) 6x + 8 | **CO1** |
| **11** | A relation R is said to be circular if aRb and bRc together imply cRa. Which of the following options is/are correct?   |  | | --- | | 1. If a relation S is reflexive and symmetric, then S is an equivalence relation. 2. If a relation S is circular and symmetric, then S is an equivalence relation. 3. If a relation S is reflexive and circular, then S is an equivalence relation. 4. If a relation S is transitive and circular, then S is an equivalence relation. | |  |
| **12** | Consider the following sets, where n≥2:  **S1:** Set of all n×n matrices with entries from the set {a,b,c}  **S2:** Set of all functions from the set {0,1,2 ... ,n2−1} to the set {0,1,2}  Which of the following choice(s) is/are correct?   |  | | --- | | 1. There does not exist a bijection from S1 to S2 | | 1. There exists a surjection from S1 to S2 | | 1. There exists a bijection from S1 to S2 | | 1. There does not exist an injection from S1 to S2 | |  |
| **13** | Let S be a set of consisting of 10 elements. The number of tuples of the form (A,B) such that A and B are subsets of S, and A⊆B is \_\_\_\_\_\_\_\_\_\_\_ .   |  | | --- | | 1. 59049 | | 1. 1024 | | 1. 50049 | | 1. 59000 | |  |
| **14** | Consider the binary relation R = {(x, y), (x, z), (z, x), (z, y)} on the set {x, y, z}. Which one of the following is TRUE?   |  | | --- | | 1. R is symmetric but NOT antisymmetric | | 1. R is NOT symmetric but antisymmetric | | 1. R is both symmetric and antisymmetric | | 1. R is neither symmetric nor antisymmetric | |  |
| **15** | If P, Q, R are subsets of the universal set U, then  2   |  | | --- | | 1. U | | 1. Pc U Qc U Rc | | 1. P U Qc U Rc | | 1. Qc U Rc | |  |
| **16** | Let S be a set of nelements. The number of ordered pairs in the largest and the smallest equivalence relations on S are:   |  | | --- | | 1. n and n | | 1. n2 and n | | 1. n2 and 0 | | 1. n and 1 | |  |
| **17** | Let R be a relation on the set of ordered pairs of positive integers such that ((p, q), (r, s)) ∈ R if and only if p–s = q–r. Which one of the following is true about R?   |  | | --- | | 1. Both reflexive and symmetric | | 1. Reflexive but not symmetric | | 1. Not reflexive but symmetric | | 1. Neither reflexive nor symmetric | |  |
| **18** | Let f be a function from a set A to a set B, g a function from B to C, and h a function from A to C, such that h(a) = g(f(a)) for all a ∈ A. Which of the following statements is always true for all such functions f and g?   |  | | --- | | 1. g is onto => h is onto | | 1. h is onto => f is onto | | 1. h is onto => g is onto | | 1. h is onto => f and g are onto | |  |
| **19** | Let A be a set with n elements. Let C be a collection of distinct subsets of A such that for any two subsets S1 and S2 in C, either S1⊂ S2 or S2⊂ S1. What is the maximum cardinality of C?   |  | | --- | | 1. n | | 1. n + 1 | | 1. 2(n-1) + 1 | | 1. n! | |  |
| **20** | [GATECS201612](http://www.geeksforgeeks.org/wp-content/uploads/gq/2016/02/GATECS201612.png)[This Question was originally a Fill-in-the-Blanks question]   |  | | --- | | 1. 1 | | 1. 2 | | 1. 3 | | 1. 4 | |  |
| **21** | A binary relation R on N x N is defined as follows:  (a, b) R (c, d) if a <= c or b <= d.  Consider the following propositions:  P: R is reflexive  Q: R is transitive  Which one of the following statements is TRUE?   |  | | --- | | 1. Both P and Q are true. | | 1. P is true and Q is false. | | 1. P is false and Q is true. | | 1. Both P and Q are false | |  |
| **22** | Let P, Q and R be sets let Δ denote the symmetric difference operator defined as PΔQ = (P U Q) - (P ∩ Q). Using Venn diagrams, determine which of the following is/are TRUE? PΔ (Q ∩ R) = (P Δ Q) ∩ (P Δ R) P ∩ (Q ∩ R) = (P ∩ Q) Δ (P Δ R)   |  | | --- | | 1. I only | | 1. II only | | 1. Neither I nor II | | 1. Both I and II | |  |
| **23** | What is the cardinality of the set of integers X defined below? X = {n | 1 ≤ n ≤ 123, n is not divisible by either 2, 3 or 5}   |  | | --- | | 1. 28 | | 1. 33 | | 1. 37 | | 1. 44 | |  |
| **24** | Suppose A is a finite set with *n* elements. The number of elements in the largest equivalence relation of A is   |  | | --- | | 1. n | | 1. n^2 | | 1. 1 | | 1. n+1 | |  |
| **25** | Let X, Y, Z be sets of sizes x, y and z respectively. Let W = X x Y. Let E be the set of all subsets of W. The number of functions from Z to E is:   |  | | --- | | 1. z2xy | | 1. z x 2 xy | | 1. z2x + y | | 1. 2xyz | |  |
| **26** | Let S denote the set of all functions f: {0,1}4 -> {0,1}. Denote by N the number of functions from S to the set {0,1}. The value of Log2Log2N is \_\_\_\_\_\_.   |  | | --- | | 1. 12 | | 1. 13 | | 1. 15 | | 1. 16 | |  |
| **27** | Consider the following relation on subsets of the set S of integers between 1 and 2014. For two distinct subsets U and V of S we say U < V if the minimum element in the symmetric difference of the two sets is in U. Consider the following two statements:  S1: There is a subset of S that is larger than every other subset.  S2: There is a subset of S that is smaller than every other subset.  Which one of the following is CORRECT?   |  | | --- | | 1. Both S1 and S2 are true | | 1. S1 is true and S2 is false | | 1. S2 is true and S1 is false | | 1. Neither S1 nor S2 is true | |  |
| **28** | Let X and Y be finite sets and f: X -> Y be a function. Which one of the following statements is TRUE? [GATECS2014Q11](http://www.geeksforgeeks.org/wp-content/uploads/gq/2014/04/GATECS2014Q111.png)   |  | | --- | | 1. A | | 1. B | | 1. C | | 1. D | |  |
| **29** | 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 | | 1. X ⊃ Y | | 1. X = Y | | 1. X - Y ≠ φ and Y - X ≠ φ | |  |
| **30** | Let A, B and C be non-empty sets and let X = (A - B) - C and Y = (A - C) - (B - C). Which one of the following is TRUE?   |  | | --- | | 1. X = Y | | 1. X ⊂ Y | | 1. Y ⊂ X | | 1. none of these | |  |

Answer

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1-A | 2-A | 3-C | 4-C | 5-D | 6-A | 7- C | 8-B | 9-A | 10-A |
| 11-C | 12-B,C | 13-A | 14-D | 15-A | 16-B | 17-C | 18-C | 19-B | 20-B |
| 21-B | 22-C | 23-B | 24-B | 25-D | 26-D | 27-A | 28-D | 29-C | 30-A |