| |  | | --- | |  |  | |  | | --- | |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |
| **ST. JOSEPH’S UNIVERSITY, BANGALORE-27** | | | | | |
| **BCA- II SEMESTER** | | | | | |
| **SEMESTER EXAMINATION: APRIL 2023**  (Examination conducted in May 2023) | | | | | |
| **CA2321- DISCRETE MATHEMATICAL STRUCTURES** | | | | | |
|  |  |  |  |
| **Time- 2 Hrs.** | |  | **Max Marks-60** | |
|  | |  |  | |

**This question paper contains three parts.**

**PART A**

**Answer all the five questions. (5\*2=10)**

1. If A= {1,2,3} ,B={3,4,5} and C={0,2,3} the find (A ∩ B) X C.

2. How many unique 3 digit codes can be created from the 5 digits {1,2,3,4,5}if repeats are possible?

3. What is the number of possible words that can be made using the word “QUIZ” such that the vowels never come together?

4. If A = {a, b, c, d} and the function f = {(a, b), (b, d), (c, a), (d, c)}, Find the value of f – 1

5. How many Hamiltonian paths does the following graph have? Find them.

A picture containing text, clock

Description automatically generated

**PART B**

**Answer any five of the following questions. (5\*4=20)**

6. What makes the function recursive? Explain any one recursive algorithm.

7. Prove that p v (q ^ r)↔ {(p v q) ^ (p v r)} is tautology

8. Determine in how many ways can three gifts be shared among 4 boys in the following conditions-

i) No one gets more than one gift.

ii) A boy can get any number of gifts.

9. Prove using mathematical induction 1+2+3+4+5+6+…….+n=n(n+1)/2

10. Write an algorithm to sort a list of elements using Merge Sort(Use Divide and Conquer technique)

11. Consider the following graph-

A picture containing text, orange

Description automatically generated

**Observe the given sequences and predict the nature in each case(whether it’s a walk/path/circuit).justify your answer.**

**CASE1**: v4e7v1e1v2e2v3e3v4e4v5

**CASE2**: v1e1v2e2v3e3v4e4v5

**CASE3:** v1e1v2e2v3e3v4e7v1

**CASE4**: v6e5v5e4v4e3v3e2v2e1v1e7v4e6v6 [4]

**12.** Are the following two graphs isomorphic? Explain your answer with supporting statements.

A picture containing text, clock, clipart

Description automatically generated [4]

**PART B**

**Answer any three of the following questions. (3\*10=30)**

13.a. Check whether the relation R in the set{1,2,3} given by R={(1,2),(2,1)} is reflexive symmetric or transitive.

b. If X and y are the two finite sets, such that n(X U Y) = 36, n(X) = 20, n(Y) = 28, then find n( X ∩ Y).

c. Expand (5x+2y)4 using Binomial Coefficient.

**[3+3+4]**

14. a. Explain Pigeonhole principle.

b.Find out the number of ways that the letters of the word “LEADER” can be arranged**?**

**[3+7]**

15. a. What is a Planar Graph? What are the steps involved to detect planar graphs?

b. If A= {1,2,3,4} and R and S are two relations on set A defined by R={(1,2),(1,3),(2,4),(4,4)} and S={(1,1),(1,2),(1,3),(1,4),(2,3)}.

Find S o (R o R) and R o R [**5+5**]

16. a. A drawer contains 12 red and 12 blue socks, all unmatched. A person takes socks out at random in the dark. How many socks must he take out to be sure that he has at least two blue socks?

b**.** Find the length and shortest path between a and z in the weighted graph given below:Chart, line chart

Description automatically generated

**[3+7]**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***