

## Discrete Structure (CS1005)

Date: April 5<sup>th</sup> 2024

Course Instructor

Mr.M.Jamil

## Sessional-II Exam

Total Time (Hrs): 1

Total Marks: 24

Total Questions: 2

Roll No

Section

Student Signature

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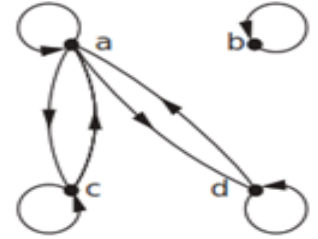
Attempt all the questions.

**CLO # 1: Explaining and solving mathematical logic of sets, relations, counting and permutations in Discrete structure.**

Q1:

[06\*02 = 12]

- a. Let  $R \subseteq A \times A$  and  $A = \{a, b, c, d\}$ , where  $R$  is represented by a directed graph in figure#1. Write the relation  $R$  in tabular form and using adjacency matrix.



- b. Using Relation  $R$  given in figure#1 determine if the  $R$  is an Equivalence relation or Partial Order. Give proper reason. **Figure#1: Directed Graph**
- c. Given relation  $R = \{(1,3), (1,4), (2,3), (2,4), (3,1), (3,4)\}$ . Obtain  $R^{-1} \circ R$ .
- d. If there are 451 history students who gave exams in ten rooms, what is the minimum possible number of students in any of the rooms?
- e. You have a computer with eight empty slots for interface cards, two parallel ports for printers, and four serial ports for modems, scanners, or mice. Suppose you have three interface cards, one printer, one mouse, and one modem. In how many ways can you connect them to your computer?
- f. Find the 45th term in the expansion of  $\left(\frac{a}{2} + \frac{b}{2}\right)^{100}$ .

National University of Computer and Emerging Sciences  
Karachi Campus

***CLO # 2: Construct formal logic, proofs and/ or informal for solving problems in discrete structure.***

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**Q2:**

**[04\*02 + 04 = 12]**

- a. Determine the Check digit for the UPCs that have 73232184434 initial 11 digits.
- b. Use Fermat's little theorem to find remainder of  $15^{35} \bmod 19$ .
- c. Encrypt the plaintext message "HOW ARE YOU" using the Ceaser cipher with  $k = 3$ .
- d. Use Euclidean algorithm to express gcd of 13 and 210 as a linear combination and identify Bezout's identities.
- e. Use Chinese remainder theorem to find the unique value of  $x$  which satisfy the following congruent relations.

$$x \equiv 6(\bmod 11), x \equiv 13(\bmod 16), x \equiv 9(\bmod 21), x \equiv 19(\bmod 25)$$

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Good Luck!