CVM UNIVERSITY
M.Sc.(INFORMATION TECHNOLOGY) – SEMESTER 1
WINTER2021 EXAMINATION

Course Code(s): 101410101

Course Title: Discrete Mathematics

Total Printed Pages : 03

Date: 22/02/2021   Time: 02.00 pm to 04.00 pm   Maximum Marks: 60

Instructions:
- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q.1 (a) Answer the following multiple choice questions. (08)

(1) The smallest set A such that A U {4,5} = {1, 2, 3, 4, 5} is
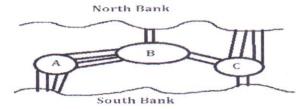   A. {3,4,5}   B. {1.2.3}
     C. {1,2}   D. {1,2,3,4,5}

(2) A = {1,2,3,4}. Let R = {(1, 2),(1,3),(3,2)}. Then R is
     E. Anti-Symmetric   F. Transitive
     G. Reflexive   H. Symmetric

(3) Hasse diagrams are first made by _____.
     A. A.R. Hasse   B. Helmut Hasse
     C. Dennis Hasse   D. T.P. Hasse

(4) In a poset P({v, x, y, z}, ⊆) which of the following is the greatest element?
     A. {vx, xy, yz}   B. 1
     C. ∅   D. {v, x, y, z}

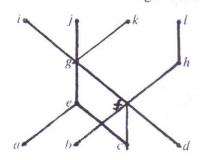(5) The determinant of identity matrix is?
     A. 1   B. 0
     C. Depends on a matrix   D. None of these.

(6) Which of the following property of matrix multiplication is correct?
     A. Multiplication is not commutative in general
     B. Multiplication is associative
     C. Multiplication is distributive over addition
     D. All of these.

(7) In a certain city there is a river running through the middle of the city. There are three islands and nine bridges as shown in the figure below.

In the given graph that appropriate models this situation would have
     A. Nine vertices and Five edges
     B. Nine vertices and Three edges
     C. Five vertices and Nine edges
     D. Three vertices and Nine edges.

(8) Which algorithm gives solution of Travelling Salesman Problem?
 A. Dijkshtra Algorithm   B. Nearest Neighbor Algorithm
 C. Optimal Algorithm   D. None of these.

(b) **Answer the following. (Fill in the blanks and True or False)**   **(08)**
(1) When A = φ, then number of elements in P(A) is _____.
(2) Find the cardinal number of the given set : "The set of months in a year."
(3) If M is the set of letters used in the word 'KOLKATA'; then M = {k, o, l, a t}. (True/False)
(4) A matrix that has only one row is known as a _____ matrix.
(5) If in a matrix all the elements are zero then it is called a _____ matrix
(6) If all the elements of a principal diagonal in a diagonal matrix are 1, then it is called a unit matrix. (True/ False)
(7) A Partially Ordered Set in which every pair of elements has both a least upper bound and a greatest lower bound is called

_____.

(8) Eulerian Circuit is an Eulerian Path which starts and ends on the same vertex. (True/ False)

Q.2   **Attempt any six of the following.**   **(12)**
(1) Define Set, Power Set and Universal Set.
(2) Let A = set of natural numbers less than 8, B = {even natural numbers less than 12} C = {Multiples of 3 between 5 and 15}, and D = {Multiples of 4 greater than 6 and less than 20}; **Find**
 [1] $(A \cup D) \cup (A \cap C)$
 [2] $(B \cup D) \cap (C \cup A)$
(3) Let f: R->R and g:R->R be defined by f(x) = x + 1 and g(x)=2x2 + 3. Find f o g and g o f. Is f o g = g o f?
(4) Explain ONE-to-ONE and ONTO function with example.
(5) Draw Hasse diagram for ({3, 4, 12, 24, 48, 72}, /)
(6) Find the determinant of given matrices.
 [i]

$$A = \begin{bmatrix} 3 & 8 \\ 4 & 6 \end{bmatrix}$$

(7) A POSET is represented by Hasse diagram. Find the upper and lower bounds of the following subsets:

[i] {e,f}; [ii]{f,h}; [iii] {e,h}
(8) Define Multi Graph and Weighted Graph with suitable example.

Q.3   Write a note on Classification of Relations with suitable example.   **(08)**
               OR

Q.3   [i] Let A = {1, 2, 3}. Then investigate the following relations for   **(08)**
reflexive, symmetric, antisymmetric, or transitive.

[1] R = {(1,1), (2,2), (3,3),(1,3),(1,2)}
[2] R = {(1,1), (2,2), (1,3), (3,1)}
[3] R = {(1,1), (2,2),(3,3),(1,2),(2,1),(2,3),(3,2)}

[ii] Let A = { 1, 2, 3, 4}. Investigate the following relations as a
function for Injective, Surjective, Bijective from A to A.

[1] f={(2,3), (1,4), (2,1), (3,2), (4,4)}
[2] g = {(3,1), (4,2), (1,1)}
[3] h = {(2,1), (3,4), (1,4), (2,1), (4,4)}

Q.4   Define Matrix. Also Explain Types of Matrices with suitable   **(08)**
examples.

OR

Q.4   Draw the Hasse diagram for the poset (A, /) of given the set   **(08)**
A={2,3,4,5,8,10,12,24,30}and the divisibility relation on it.
[1] Find the maximal elements and minimal elements.
[2] Find all upper bounds of {8,12}
[3] Find all lower bounds of {8,12}
[4] What is the least upper bound and greatest lower bound of
{4, 8}?

Q.5   Find the Rank of the following matrices.   **(08)**

[i]
$$\begin{pmatrix} 1 & 3 & 5 \\ 2 & -1 & 4 \\ -2 & 8 & 2 \end{pmatrix}$$

[ii]
$$\begin{pmatrix} 5 & 3 & 7 & 4 \\ 3 & 26 & 2 & 9 \\ 7 & 2 & 10 & 5 \end{pmatrix}$$

OR

Q.5   Find the Eigen values and Eigen Vectors of the given matrix.   **(08)**

$$A = \begin{pmatrix} 7 & 3 \\ 3 & -1 \end{pmatrix}$$

Q.6   Explain Travelling Salesperson Problem with NN Algorithm.   **(08)**

OR

Q.6   Explain Euler Path and Circuit with suitable example.   **(08)**

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