Day : Thursday   Time : 10:00 AM-01:00 PM
**Date :** 13-01-2022   **W-11053-2021**   Max. Marks: **100**

N. B. :
1) Attempt **ANY FOUR** questions from section – **I** and **ANY TWO** questions from section – **II**.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in **SEPARATE** answer books.
4) Use of non-programmable calculator is **ALLOWED**.

SECTION – I

Q. 1   A bag contains six white marbles and five red marbles. Find the number of   **(15)** ways four marbles can be drawn from the bag if:

a)   They can be any color.

b)   Two must be white and two red.

c)   One red and three white

Q. 2   Define isomorphism. State whether the following graphs are isomorphic or   **(15)** not.
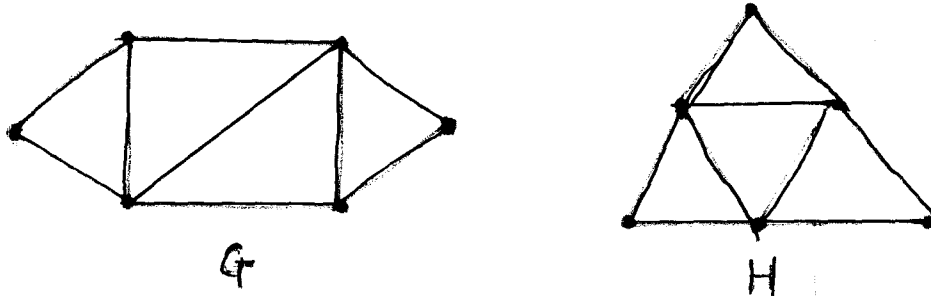

Q. 3   Apply Dijkstra's algorithm and determine the shortest distance from vertex   **(15)** 'a' to each of the other vertices in the directed graph:
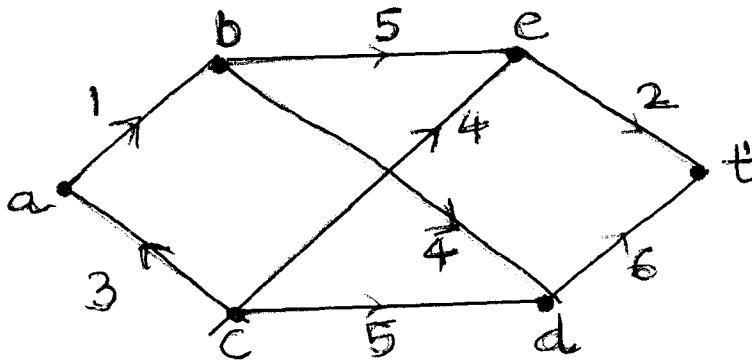
Q. 4   Two fair dice are thrown. Find the probability that: **(15)**

a)   The total score is 10.

b)   Sum of the scores is a prime number.

c)   The product on upper most faces is either prime number or even number.

P. T. O.

Q. 5 **a)** Represent the graph with an Incidence Matrix. **(08)**
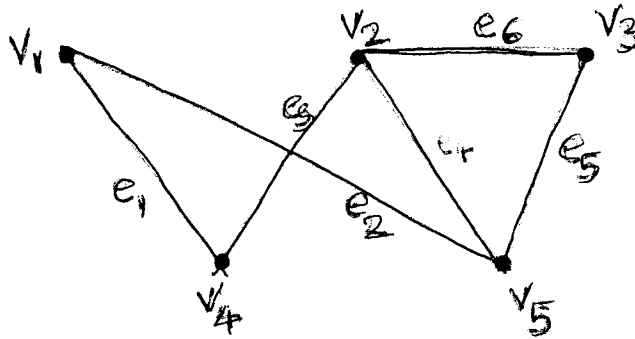
b) Write note on Applications of trees. **(07)**

Q. 6 Find the number of distinct permutations that can be formed from all the **(15)** letters of given words:

    ii)   RADAR   **ii)**   UNUSUAL   **iii)**   MISSISSIPPI

Q. 7 Write short notes on **ANY THREE** of the following: **(15)**

a) Coloring of Graphs

b) Bridges of Konigsberg

c) Depth – First Algorithm

d) Application of Pigeonhole principle

SECTION – II

Q. 8 **a)** Explain the following applications of graph: **(10)**

    i)   Utilities problem

    ii)   Seating arrangement problem

b) If A and B are any two events such that **(10)**
$P(A) = 1/3$, $P(B) = 1/4$ and $P(A \cup B) = 1/2$,
then :

    i)   Find P (A/B) and P (B/A)

    ii)   Are A and B independent?

Q. 9 Let $A = \{1, 2, 3, 4\}$ and $R = \{(2, 1)(2, 3)(3, 1)(3, 4)(4, 1)(4, 3)\}$ be the **(20)** relation of A.
Find the transitive closure of R using Warshall's Algorithm.

Q. 10 In an office there are 3 clerks assigned to process the incoming copies of a **(20)** certain form. The first clerk processes 40 % of the forms and has an error rate (probability error) of 0.04, the second clerk possesses 35 % forms with an error rate of 0.06. While the third clerk processes the rest and has the error rate of 0.03. A form chosen randomly from day's output is found to have an error.
Find the chance that it was processed by the first clerk, second clerk and third clerk.

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