Math 142
Test #3
Spring 2024

Name: _____

1. You have a geography test consisting of a column of 10 countries and a column of 10 export products. Your task is to match each country to its top export. Knowing that each country has only one top export and all exports listed are different and used only once, how many different ways are there to complete the test?

    a. 20*19*18*17*16*15*14*13*12*11*10
    b. 5*4*3*2*1
    c. 10!
    d. 20!
    e. None of these

2. You need to make a true/false test consisting of 8 questions. To make it easier to grade, you want the first two questions are to be true and the last three questions to be false. How many total different ways are there for a student to answer the remaining questions given the fact that the first two questions are true and the last three questions are false?

    a. 64
    b. 8
    c. 16
    d. 32
    e. None of these

3. You were a witness to a hit-and-run accident. You saw the license plate of the driver's car, but you only saw the first two letters and the last two numbers. The license plate had three letters followed by four digits. You know all letters in the alphabet are allowed on the license plate, the values 0-9, and that repetition is allowed, how many possible license plates and their drivers must be investigated as possible suspects in the case?

    a. 56
    b. 2600
    c. 260
    d. 24,000
    e. None of these

4. An Euler Circuit MUST:

(a) Have all nodes of even degree.
(b) Travel through each ***node*** of the diagram only once.
(c) Start and end at the same node.
(d) Both a and c
(e) All of these

5. A Hamilton Circuit MUST:

(a) Travel through each ***node*** of the diagram only once.
(b) Have nodes of all even degree
(c) Start and end at the same vertex
(d) Both a and c
(e) All of these

6. Which of the following graphs are trees?

Diagram I

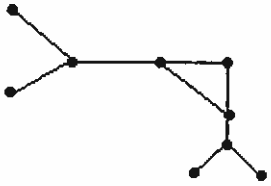


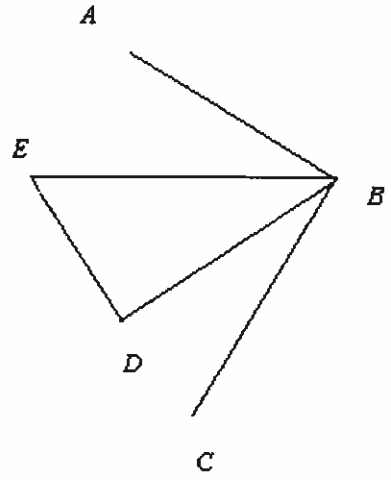
Diagram II

Diagram III

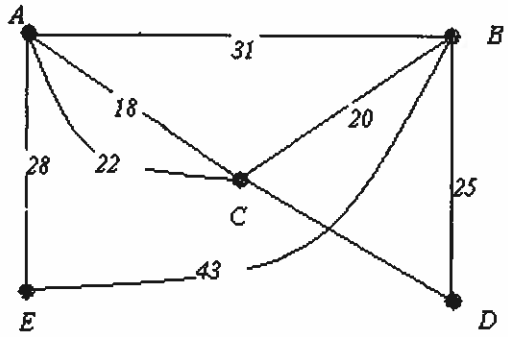
(a) Diagram III only
(b) Diagrams I and III only
(c) Diagrams II and III only
(d) Diagram II only
(e) Diagram I only

7. Which of the following edges listed could be removed to obtain a tree?

a. BE b. AB c. BC d. CD e. None of these



8. For the graph below, find the weight of the minimum spanning tree using Kruskal's Algorithm (assume each edge's units are in miles).



(a) 137 miles
(b) 84 miles
(c) 91 miles
(d) 134 miles
(e) None of these

9. Given a tree with 153 nodes. How many edges exist for that tree?

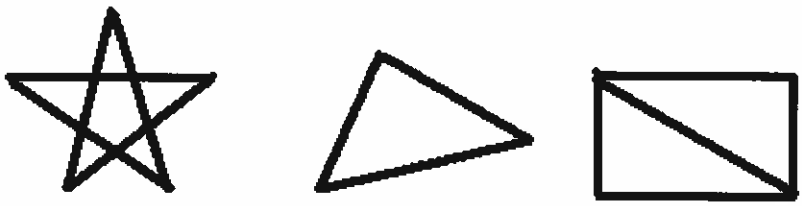
(a) 151
(b) 154
(c) 153
(d) 152
(e) None of these

10. An Euler path MUST:

i) Start and end at the same node.
ii) Start at an odd degree node and end at a different odd degree node.
iii) Be transversable.
iv) Have only two nodes of odd degree

(a) Choices i, ii, iii only
(b) Choices ii, iii, iv only
(c) Choices ii and iv only
(d) Choices i, iii, iv only
(e) All of these choices

11. Of the diagrams below, which has an Euler Circuit?



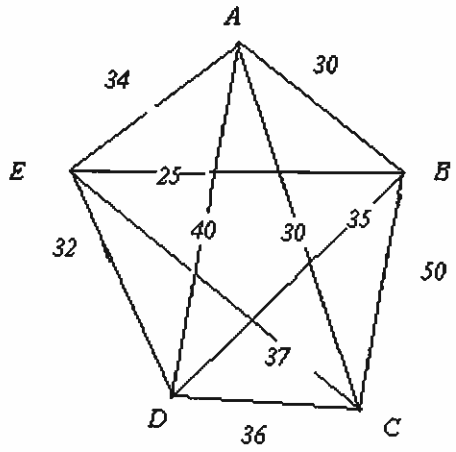
(I) *(II)* *(III)*

(a) Diagrams I and II only
(b) Diagrams I and III only
(c) Diagrams II and III only
(d) All of these diagrams have an Euler Circuit
(e) None of these diagrams have an Euler Circuit

12. In the diagrams from question #11, which are transversable and display an Euler Path?

(a) Diagram I and II only
(b) Diagram I and III only
(c) Diagram III only
(d) All of the above diagrams are transversable and an Euler Path.

13. Using the graph given below and the Nearest Neighbor Algorithm, find an efficient Hamiltonian Circuit. What is the total distance of the route if the values between nodes are in miles? Node A is the home vertex.



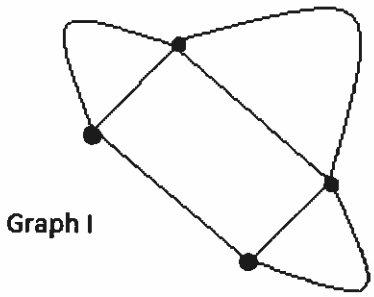
(a) 168 miles
(b) 153 miles
(c) 117 miles
(d) 161 miles
(e) None of these

14. A given graph has 9 nodes. How many ***unique*** Hamilton Circuits exist for the graph?

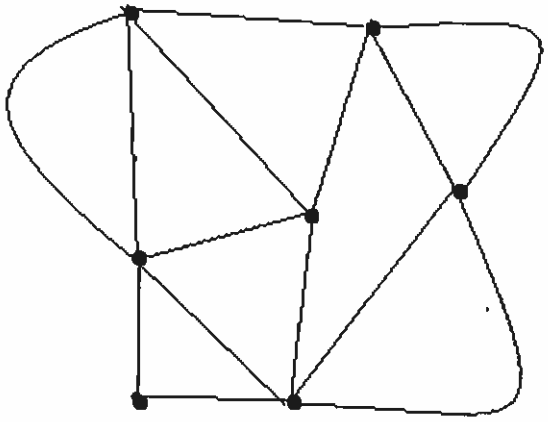
(a) 362,880
(b) 181,440
(c) 20,160
(d) 40,320
(e) None of these

15. Given the four graphs below, which statement(s) are true?

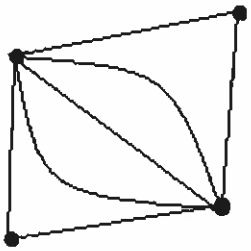
a. Two graphs display an Euler Circuit and two display Euler Paths.
b. One graph displays an Euler Circuit and three display Euler Paths.
c. Three graphs display an Euler Path and no Euler Circuits.
d. All graphs display an Euler Path and no Euler Circuits.
e. No graph displays an Euler Circuit and none an Euler Circuit.



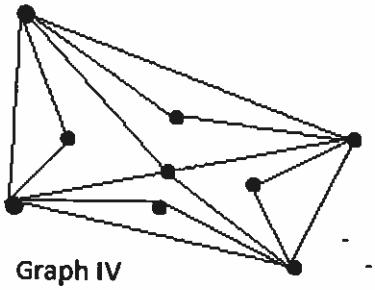
Graph I



Graph II



Graph III



Graph IV

16. Given the graphs from question 15, which displays and Euler path?

i. Graph I
ii. Graph II
iii. Graph III
iv. Graph IV

(a) Choice i and iii only
(b) Choices i iii and iv only
(c) Choices i, ii and iii only
(d) Choice i only
(e) Choice ii and iv only

17. A school system looking to make a major change wants to transfer 10 of its 12 math teachers to another school. In how many ways can the 10 teachers be chosen?

(a) 132 ways
(b) 396 wayu
(c) 72 ways
(d) 66 ways
(e) None of these

18. How many possible phone numbers exist for a wireless company to use for their customers given that the area code is (540) followed by a three digit connection code **(that cannot start with 0 or 1)** followed by 4 digits. Repetition of digits is allowed and the digits 0-9 are allowed?

(a) 10,000,000
(b) 8,000,000
(c) 4,000,000
(d) 450,000,000
(e) None of these

19. A football coach wants to chose three senior players as captains of the team. If the coach has 7 senior players, how many ways is this possible?

(a) 7!
(b) 42
(c) 5!
(d) 21
(e) None of these

20. A painter is carrying six buckets of different colored paints. He slips and drops five of the buckets. The paints fall to ground and mix. How many new colors could be formed when they are dropped to the ground and mix?

(a) 5
(b) 120
(c) 5!
(d) 6
(e) None of these