MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Figure 5.1
Use the figure below to answer the following question(s).

1) In Figure 5.1, vertex B is adjacent to
A) vertex C and vertex D only.
B) vertex D only.
C) every other vertex.
D) vertex B and vertex E only.
E) None of the above

2) In Figure 5.1, which of the following is not a circuit in the graph?
A) C, A, D, C
B) A, D, C, D, E, D, A
C) E, D, C, C, E
D) A, D, E, C, A
E) All of the above are circuits in the graph.

3) In Figure 5.1, which of the following is a bridge of the graph?
A) BD
B) CC
C) AD
D) EC
E) None of the above

4) A graph has an Euler circuit if
A) every vertex has even degree.
B) it is connected and has an even number of vertices.
C) it is connected and has an even number of edges.
D) it is connected and every vertex has even degree.
E) None of the above
5) A graph without an Euler circuit but with an Euler path

A) must be connected and every vertex must have even degree.
B) must be connected and every vertex must have odd degree.
C) must be connected and have exactly one vertex of odd degree.
D) must be connected and have exactly two vertices of odd degree.
E) None of the above

Situation 5.7
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.

6) In Situation 5.7, a 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.
E) None of the above

7) In Situation 5.7, in the graph that models this situation, the degree of the vertex that represents the North Bank is

A) 1.
B) 2.
C) 3.
D) 4.
E) None of the above

8) In Situation 5.7, it is possible to take a walk though this town, starting on the South Bank, crossing each bridge once (and only once) and ending

A) on island B.
B) on island C.
C) on the North Bank.
D) back on the South Bank.
E) None of the above
9) The basic rule in Fleury’s algorithm is

A) never travel across a bridge of the original graph.
B) only travel across a bridge of the untraveled part of the graph if there is no other alternative.
C) only travel across a bridge on the original graph if there is no other alternative.
D) never travel across a bridge of the untraveled part of the graph.
E) None of the above

Figure 5.4
Use the figure below to answer the following question(s).

10) In Figure 5.4, which of the drawings has an open unicursal tracing?
A) Fig. 1 only
B) Fig. 2 only
C) Fig. 3 only
D) Fig. 1 and Fig. 3
E) None of the above

11) In Figure 5.4, which of the drawings has a closed unicursal tracing?
A) Fig. 1 only
B) Fig. 2 only
C) Fig. 3 only
D) Fig. 1 and Fig. 3
E) None of the above

12) In a complete graph with 12 vertices (A through L), the total number of Hamilton circuits (including mirror-image circuits) that start at vertex A is
A) 10!.
B) 11!.
C) 12!.
D) 13!.
E) None of the above

13) In a complete graph with n vertices there is a total of
A) (1/2)n(n - 1) edges.
B) n(n - 1) edges.
C) n(n + 1) edges.
D) (1/2)n(n + 1) edges.
E) None of the above
14) \( n! = \)

A) \( 1 \times 2 \times 3 \times \ldots \times n \)
B) None of the above
C) \( n(n - 1) \)
D) \( 1 + 2 + 3 + \ldots + n \)
E) \( n + 1 \)

**Situation 6.2**
A garbage truck must pick up garbage at four different dump sites (A, B, C, and D) as shown in the graph below, starting and ending at A. The numbers on the edges represent distances (in miles) between locations. The truck driver wants to minimize the total length of the trip.

![Graph of Situation 6.2](image)

15) In Situation 6.2, an optimal solution to this problem is given by

A) A, D, B, C, A.
B) A, C, B, D, A.
C) A, D, C, B, A.
D) A, B, D, C, A.
E) None of the above

16) In Situation 6.2, the nearest-neighbor algorithm applied to the graph yields the following solution:

A) A, D, C, B, A.
B) A, B, C, D, A.
C) A, C, B, D, A.
D) A, B, D, C, A.
E) None of the above

17) In Situation 6.2, suppose instead the truck starts and ends at B. The nearest-neighbor algorithm applied to the graph yields the following solution:

A) B, D, A, C, B.
B) B, A, D, C, B.
C) B, C, D, A, B.
D) B, D, C, A, B.
E) None of the above
18) In Situation 6.2, suppose instead the truck starts and ends at D. The nearest-neighbor algorithm applied to the graph yields the following solution:

A) D, B, A, C, D.
B) D, B, C, A, D.
C) D, C, B, A, D.
D) D, A, B, C, D.
E) None of the above

19) The brute-force algorithm for solving the Traveling Salesman Problem is

A) an approximate and efficient algorithm.
B) an optimal and efficient algorithm.
C) an approximate and inefficient algorithm.
D) an optimal and inefficient algorithm.
E) None of the above

20) The nearest-neighbor algorithm for solving the Traveling Salesman Problem is

A) an approximate and inefficient algorithm.
B) an optimal and inefficient algorithm.
C) an approximate and efficient algorithm.
D) an optimal and efficient algorithm.
E) None of the above

1) Answer: B
2) Answer: B
3) Answer: A
4) Answer: D
5) Answer: D
6) Answer: C
7) Answer: C
8) Answer: C
9) Answer: B
10) Answer: A
11) Answer: C
12) Answer: B
13) Answer: A
14) Answer: A
15) Answer: C
16) Answer: D
17) Answer: A
18) Answer: B
19) Answer: D
20) Answer: C