Started on	Monday, April 19, 2021, 11:00 AM
State	Finished
Completed on	Monday, April 19, 2021, 12:02 PM
Time taken	1 hour 2 mins
Points	16.00/20.00
Grade	**80.00** out of 100.00

Question **1**

Complete

0.00 points out of 1.00

If g(n) is bounded from above by $c \cdot f(n)$ then $g(n) \in \Omega(f(n))$

Select one:

- True
- False

Question **2**

Complete

1.00 points out of 1.00

According the pseudocode for determining the Binomial Coefficient, which approach was more efficient?

Select one:

- a. Divide & Conquer (recursive)
- b. None of these approaches
- c. Brute Force
- d. Dynamic Programming (iterative)

Question **3**

Complete

1.00 points out of 1.00

The sum of coefficients in the expansion of $(x+y)^8$ is:

Answer: 256

Question **4**

Complete

1.00 points out of 1.00

For a specific weighted directed graph, Floyd's Algorithm for Shortest Path has produced the following:

$$\left[\begin{array}{c|ccccc} P^5 & 1 & 2 & 3 & 4 & 5 \\ \hline 1 & 0 & 0 & 5 & 0 & 4 \\ 2 & 4 & 0 & 1 & 0 & 5 \\ 3 & 0 & 1 & 0 & 2 & 1 \\ 4 & 1 & 0 & 2 & 0 & 0 \\ 5 & 2 & 1 & 0 & 4 & 0 \end{array}\right]$$

Using the given values, what is the shortest path from $v_3 \rightarrow v_5$

Select one:

- a. $v_3 \rightarrow v_4 \rightarrow v_1 \rightarrow v_5$
- b. $v_3 \rightarrow v_1 \rightarrow v_5$
- c. $v_3 \rightarrow v_1 \rightarrow v_4 \rightarrow v_5$
- d. $v_3 \rightarrow v_5$

Question **5**

Complete

1.00 points out of 1.00

According the pseudocode for determining the nth Fibonacci term, which approach was more efficient?

Select one:

- a. Divide & Conquer (recursive)
- b. Dynamic Programming (iterative)
- c. None of these approaches
- d. Brute Force

Question **6**

Complete

1.00 points out of 1.00

Assuming printing "Hello World" is the basic operation, what is the complexity function of the following psuedocode?

for (i=1; i ≤ n^3; i++)

for (j=1; j ≤ n^2; j++)

Print "Hello World";

Please note this is a nested for loop.

Select one:

- a. $T(n) = 2n^5$
- b. $T(n) = n^5$
- c. $T(n) = n^6$
- d. $T(n) = 2n^6$

Question **7**

Complete

1.00 points out of 1.00

If our Dynammic Programming algorithm is applied to the Traveling Salesman Problem for an *undirected* weighted graph then for every tour there will be a tour of the same length which simply visits the vertices in the opposite order.

Select one:

- True
- False

Question **8**

Complete

0.00 points out of 1.00

Assume you are given directed weighted graph with *n* vertices where every vertex is connected to all others. The total number of distinct *paths* is:

Select one:

- a. e^n
- b. $ln(n)$
- c. $(n-1)!$
- d. $n! \cdot e$

Question **9**

Complete

1.00 points out of 1.00

For the Traveling Salesman Problem, we are given the following adjacency matrix representing a weighted directed graph with 4 nodes.

W	1	2	3	4
1	0	2	∞	3
2	1	0	4	∞
3	∞	3	0	2
4	2	∞	1	0

What is the value of $D[1][\{2,3,4\}]$?

D	$\emptyset$	$\{2\}$	$\{3\}$	$\{4\}$	$\{2,3\}$	$\{2,4\}$	$\{3,4\}$	$\{2,3,4\}$
1	0	–	–	–	–	–	–	**?**
2	1	–	∞	∞	–	–	8	–
3	∞	3	–	4	–	∞	–	–
4	2	∞	∞	–	4	–	–	–

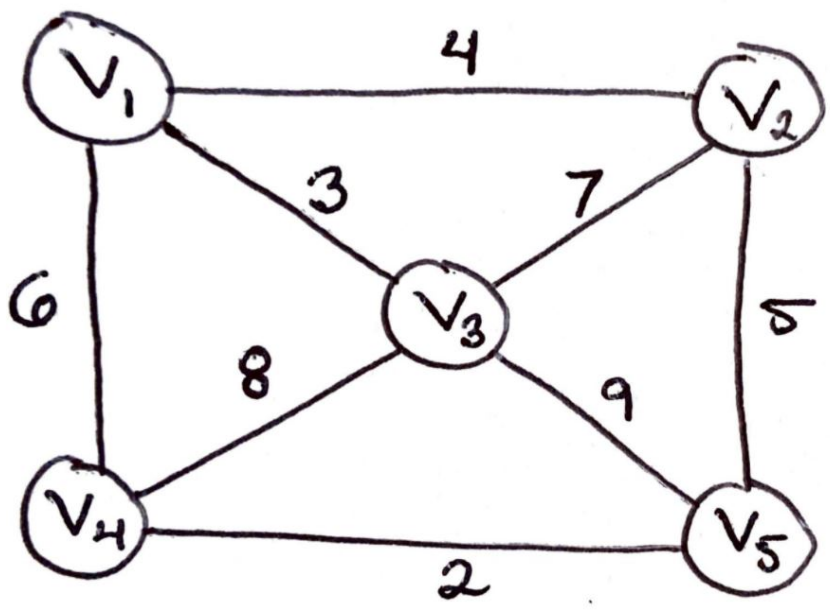
Answer: 7

Question **10**

Complete

1.00 points out of 1.00

Consider the following undirected weighted graph. Using Kruskal's algorithm, what is the last edge added to the tree?



Select one:

- a. (v_1, v_3)
- b. (v_2, v_5)
- c. (v_4, v_5)
- d. (v_3, v_5)

Question **11**

Complete

1.00 points out of 1.00

Using the Master Theorem, determine the Θ-category of $T(n) = 16T(\frac{n}{2}) + n^4$

Select one:

- a. $T(n) \in \Theta(n^2)$
- b. $T(n) \in \Theta(n^4)$
- c. $T(n) \in \Theta(n^4 logn)$
- d. The Master Theorem does not apply here

Question **12**

Complete

0.00 points out of 1.00

In the Traveling Salesman Problem, assuming that A is a set of vertices that are all visited exactly once, if we found the shortest tour going from $v_1 \rightarrow A \rightarrow v_1$ then that is also the shortest tour from $v_4 \rightarrow A \rightarrow v_4$.

Select one:

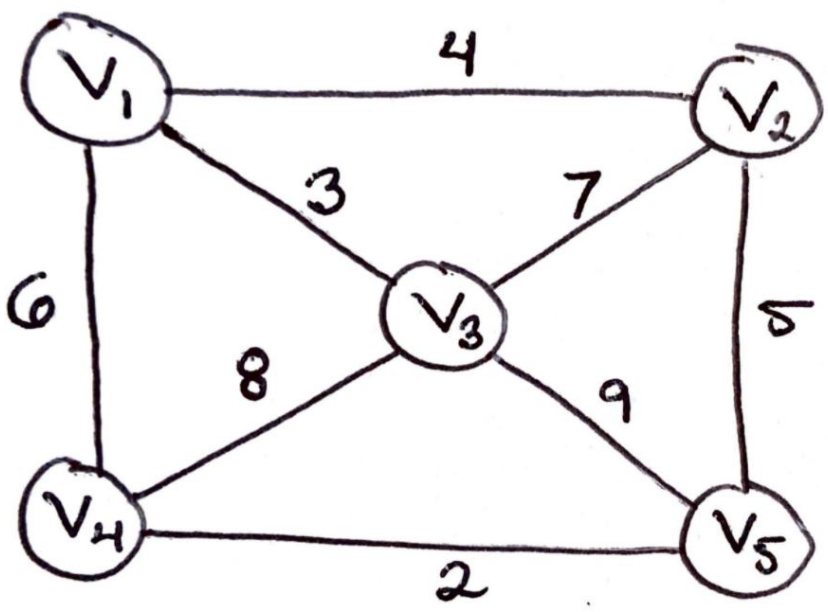
- True
- False

Question **13**

Complete

1.00 points out of 1.00

Consider the following undirected weighted graph. Using Prim's algorithm, beginning with v_1, what is the last edge added to the tree?



Select one:

- a. (v_2, v_5)
- b. (v_3, v_5)
- c. (v_4, v_5)
- d. (v_1, v_4)

Question **14**

Complete

1.00 points out of 1.00

For the Traveling Salesman Problem, we are given the following adjacency matrix representing a weighted directed graph with 4 nodes.

W	1	2	3	4
1	0	2	∞	3
2	1	0	4	∞
3	∞	3	0	2
4	2	∞	1	0

Here is the partially completed D array corresponding the adjacency matrix above.

D	$\emptyset$	$\{2\}$	$\{3\}$	$\{4\}$	$\{2,3\}$	$\{2,4\}$	$\{3,4\}$	$\{2,3,4\}$
1	0	–	–	–	–	–	–	?
2	1	–	∞	∞	–	–	8	–
3	∞	3	–	4	–	∞	–	–
4	2	∞	∞	–	4	–	–	–

Here is the partially completed P array corresponding to the D array above. On the basis of your computations, what is the value of $P[1][\{2,3,4\}]$?

P	$\emptyset$	$\{2\}$	$\{3\}$	$\{4\}$	$\{2,3\}$	$\{2,4\}$	$\{3,4\}$	$\{2,3,4\}$
1	–	–	–	–	–	–	–	**?**
2	–	–	3	4	–	–	3	–
3	–	2	–	4	–	2, 4	–	–
4	–	2	3	–	3	–	–	–

Answer: 4

Question **15**

Complete

1.00 points out of 1.00

For the given matrix, what is the value of $D^5[4][1]$?

D^4	1	2	3	4	5
1	0	4	14	∞	19
2	9	0	12	10	1
3	3	∞	0	2	5
4	16	13	7	0	11
5	1	6	8	∞	0

Answer: 12

Question **16**

Complete

1.00 points out of 1.00

Algorithm 1.1 Sequential Search

Problem: Is the key x in the array S of n keys?

Inputs (parameters): positive integer n, array of keys S indexed from 1 to n, and a key x.

Outputs: *location*, the location of x in S (0 if x is not in S).

```
void seqsearch (int n,
                const keytype S[ ],
                keytype x,
                index& location)

{
    location = 1;
    while (location<=n && S[location] != x)
        location++;
    if (location > n)
        location=0;
```

What is the primary basic operation from the given pseudocode?

Note: There may be more than one correct answer

Select one or more:

- [x] a. S[location] != x
- [ ] b. location++
- [x] c. location > n
- [ ] d. location <= n

Question **17**

Complete

0.00 points out of 1.00

In the Floyd Algorithm, if the value of $P^n[i][j]$ is 0 then there is no direct path from v_i to v_j.

Select one:

- (•) True
- ( ) False

Question **18**

Complete

1.00 points out of 1.00

After observing Binary Search and Sequential Search we found that Sequential Search was more efficient than Binary Search due to it's superior Dynammic Programming approach to find where a specific item was located.

Select one:

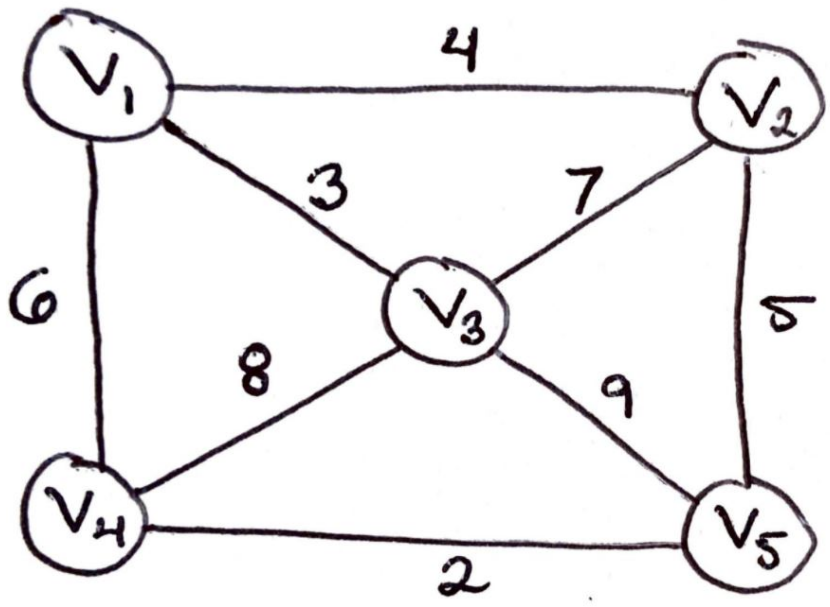
- ( ) True
- (•) False

Question **19**

Complete

1.00 points out of 1.00

What is the total weight of the minimum spanning tree produced by Kruskal's algorithm with the given undirected weighted graph?



Answer: 14

Question **20**

Complete

1.00 points out of 1.00

In the Floyd Algorithm, if the value of $P^n[i][j] = k$ where $k \neq 0$ then k is the index of the highest-numbered intermediate vertex on the shortest path from $v_i \rightarrow v_j$.

Select one:

- True
- False

◄ Midterm 1, Grade Distribution

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Zoom Meeting Jan. 25, 2021 ►