

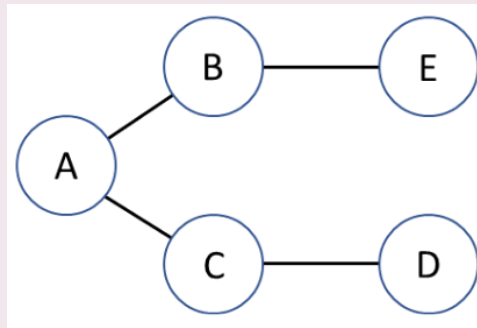
Who wants to be a ~~millionaire~~ Computer Scientist?

Preparation for the finals

Game 1

Question 1. 500 points

- If a **breadth-first search** starts at vertex E, the last vertex to be visited will be vertex _____.

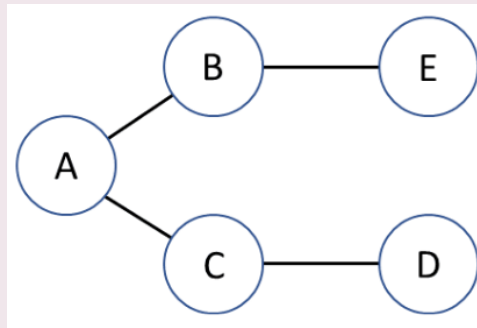


A	A
B	C

C	D
D	B

Question 1. 500 points

- If a **breadth-first search** starts at vertex E, the last vertex to be visited will be vertex _____.



A	0
B	6

C	3
D	2

The correct answer is C.

Question 2. 1,000 points

- At what position will we find **8** in the **min-heap** array below after we call *dequeue()*?

2	3	6	8	10	15	18	25
0	1	2	3	4	5	6	7

A	0
B	3

C	1
D	5

Question 2. 1,000 points

- At what position will we find **8** in the **min-heap** array below after we call *dequeue()*?

2	3	6	8	10	15	18	25
0	1	2	3	4	5	6	7

A	0
B	3

C	1
D	5

The correct answer is C.

Question 3. 2,000 points

- Given the following table, where a hash function returns $\text{key} \% 11$, which values can be inserted sequentially without collision?

hashTable

0	11
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

A	22, 33, 44
B	23, 35, 47

C	23, 34, 45
D	22, 34, 45

Question 3. 2,000 points

- Given the following table, where a hash function returns $\text{key} \% 11$, which values can be inserted sequentially without collision?

hashTable

0	11
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

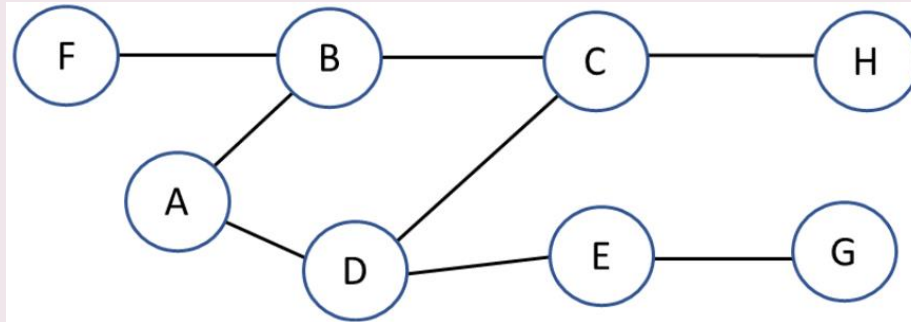
A	22, 33, 44
B	23, 35, 47

C	23, 34, 45
D	22, 34, 45

The correct answer is B.

Question 4. 3,000 points

- Assuming that a breadth-first search starts at E, which vertices are in the Queue after vertices E, G, and D have been processed?

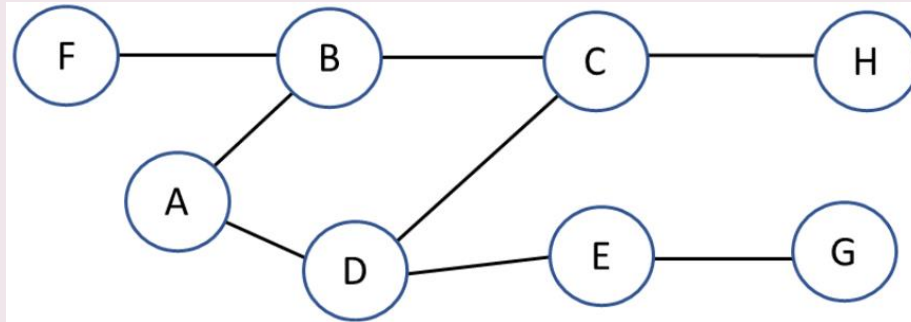


A	A, C
B	E, G

C	A, C, G
D	A, C, E, G

Question 4. 3,000 points

- Assuming that a breadth-first search starts at E, which vertices are in the Queue after vertices E, G, and D have been processed?



A	A, C
B	E, G

C	A, C, G
D	A, C, E, G

The correct answer is A.

Question 5. 5000 points

- Using double hashing, how do we determine the first index when inserting item 20?

$$\text{hash1}(\text{key}) = \text{key} \% 11$$

$$\text{hash2}(\text{key}) = 5 - \text{key} \% 5$$

and a hash table with a size of 10

- A. $(20 \% 11 + 1 * (5 - 20 \% 5)) \% 10$
- B. $(20 \% 11 + 0 * (5 - 20 \% 5)) \% 11$
- C. $(20 \% 11 + 0 * (5 - 20 \% 5)) \% 10$
- D. $(20 \% 11 + 1 * (5 - 20 \% 5)) \% 11$

A	
B	

C	
D	

Question 5. 5000 points

- Using double hashing, how do we determine the first index when inserting item 20?

$$\text{hash1}(\text{key}) = \text{key} \% 11$$

$$\text{hash2}(\text{key}) = 5 - \text{key} \% 5$$

and a hash table with a size of 10

- A. $(20 \% 11 + 1 * (5 - 20 \% 5)) \% 10$
- B. $(20 \% 11 + 0 * (5 - 20 \% 5)) \% 11$
- C. $(20 \% 11 + 0 * (5 - 20 \% 5)) \% 10$
- D. $(20 \% 11 + 1 * (5 - 20 \% 5)) \% 11$

A
B

C
D

The correct answer is C.

Checkpoint 1 reached!

You have 5,000 points

Question 6. 7,500 points

- Identify the new priority queue after enqueueing 40 into the min-heap array shown below.

29	36	42	54
----	----	----	----

A

29	36	40	42	54
----	----	----	----	----

C

29	36	42	54	40
----	----	----	----	----

B

40	29	36	42	54
----	----	----	----	----

D

29	36	42	40	54
----	----	----	----	----

A	
B	

C	
D	

Question 6. 7,500 points

- Identify the new priority queue after enqueueing 40 into the min-heap array shown below.

29	36	42	54
----	----	----	----

A

29	36	40	42	54
----	----	----	----	----

C

29	36	42	54	40
----	----	----	----	----

B

40	29	36	42	54
----	----	----	----	----

D

29	36	42	40	54
----	----	----	----	----

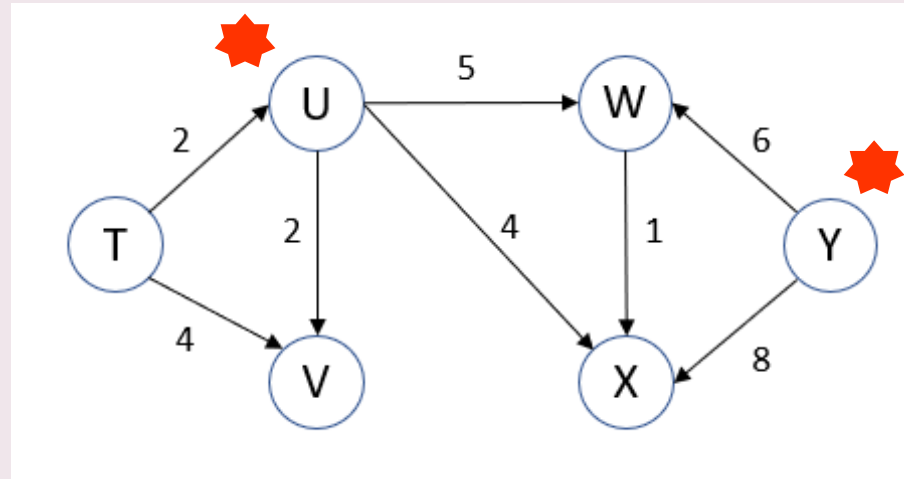
A
B

C
D

The correct answer is C.

Question 7. 10,000 points

- What is the cost of the shortest path from Y to U in the following graph?

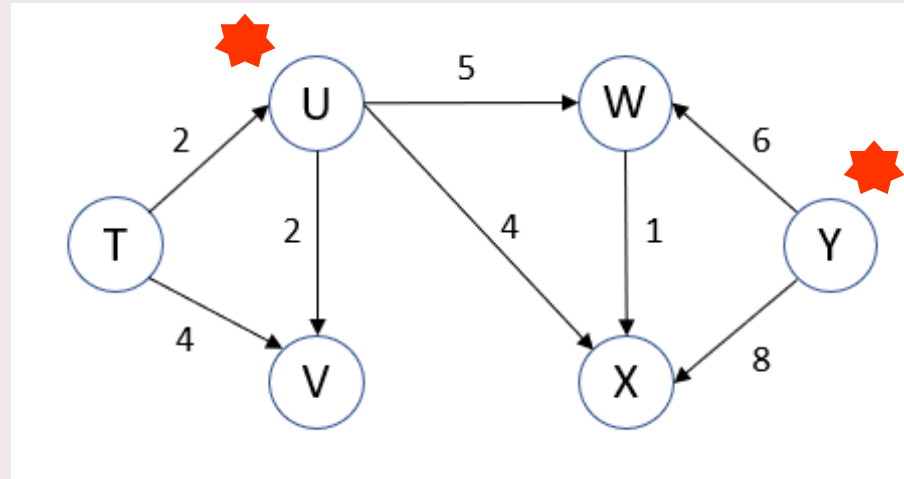


A	11
B	∞

C	12
D	Something else

Question 7. 10,000 points

- What is the cost of the shortest path from Y to U in the following graph?



A	11
B	∞

C	12
D	Something else

The correct answer is B.

Question 8. 15,000 points

- After resizing a hash table with 13 buckets, the new size will be _____.

A	26
B	29

C	23
D	31

Question 8. 15,000 points

- After resizing a hash table with 13 buckets, the new size will be _____.

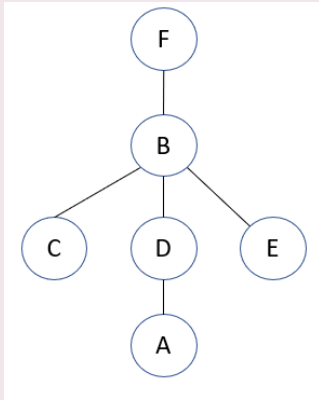
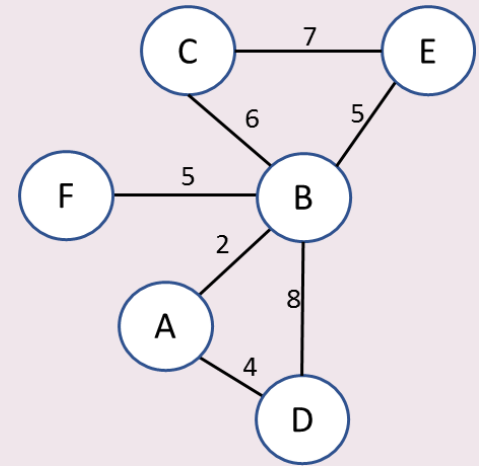
A	26
B	29

C	23
D	31

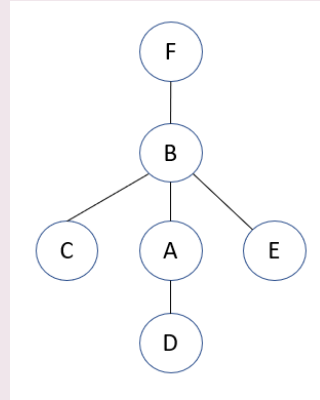
The correct answer is B.

Question 9. 25,000 points

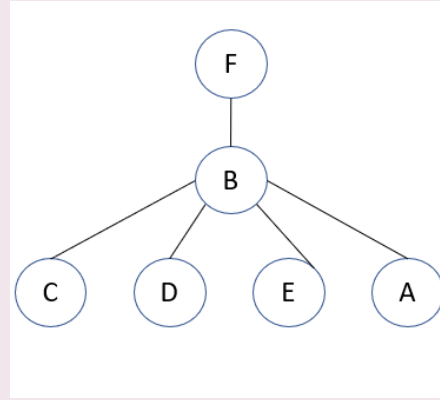
- Identify the minimum spanning tree for the following graph:



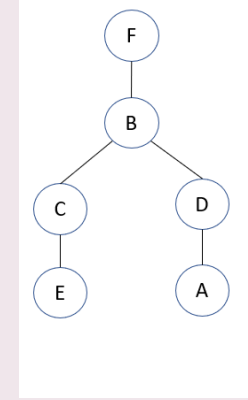
A



B



C



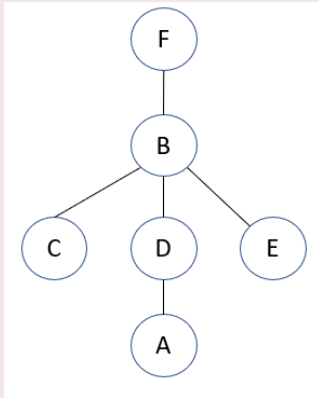
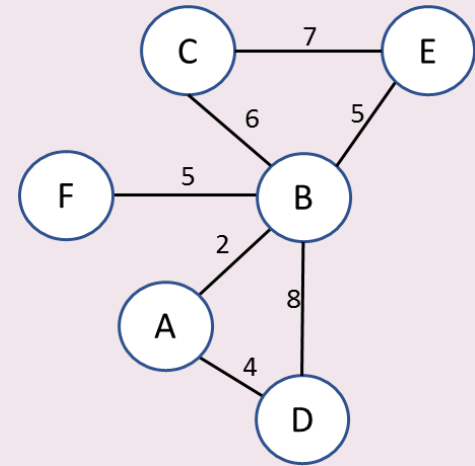
D

A	
B	

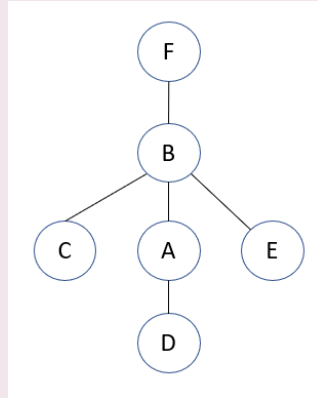
C	
D	

Question 9. 25,000 points

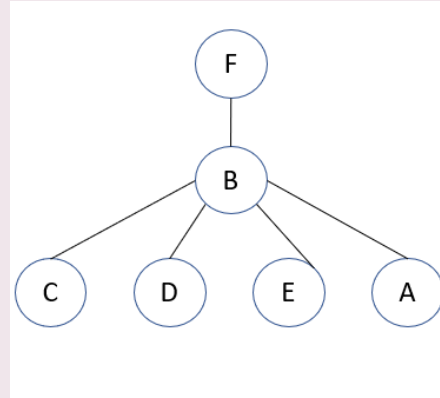
- Identify the minimum spanning tree for the following graph:



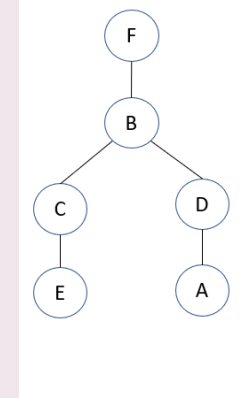
A



B



C



D

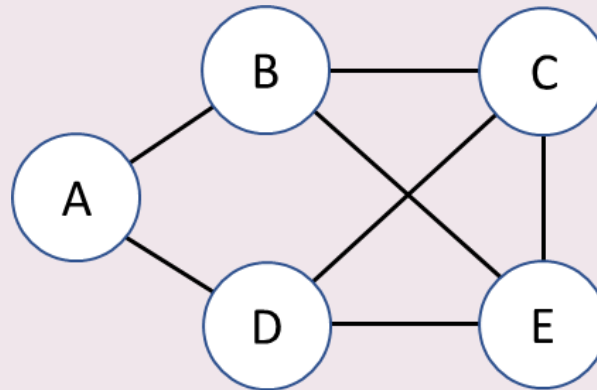
A
B

C
D

The correct answer is B.

Question 10. 50,000 points

- Identify the order in which the vertices are **discovered** during a (**non-recursive**) **DFS** traversal of the graph starting with vertex B.

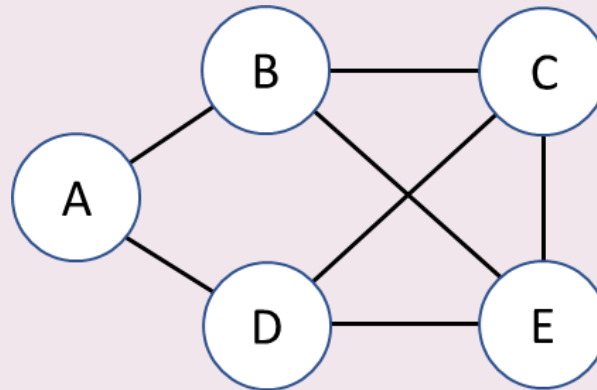


A	B,E,A,D,C
B	B,A,D,E,C

C	B,D,C,E,A
D	B,C,E,A,D

Question 10. 50,000 points

- Identify the order in which the vertices are **discovered** during a (**non-recursive**) **DFS** traversal of the graph starting with vertex B.



A	B,E,A,D,C
B	B,A,D,E,C

C	B,D,C,E,A
D	B,C,E,A,D

The correct answer is D.

Checkpoint 2 reached!

You have 50,000 points

Question 11. 75,000 points

- Identify the new max-heap-array created after the heapify operation of the following array:

47	25	36	60	54
----	----	----	----	----

A

25	36	47	54	60
----	----	----	----	----

C

60	54	36	25	47
----	----	----	----	----

B

25	47	36	60	54
----	----	----	----	----

D

60	54	47	36	25
----	----	----	----	----

A	
B	

C	
D	

Question 11. 75,000 points

- Identify the new max-heap-array created after the heapify operation of the following array:

47	25	36	60	54
----	----	----	----	----

A

25	36	47	54	60
----	----	----	----	----

C

60	54	36	25	47
----	----	----	----	----

B

25	47	36	60	54
----	----	----	----	----

D

60	54	47	36	25
----	----	----	----	----

A
B

C
D

The correct answer is C.

Question 12. 150,000 points

- Consider a hash table of size 100.
- Which hash function produces the fewest number of collisions for keys 10, 20, 30, 40, 50, and 60?

A	key % 6
B	key % 50

C	key % 10
D	key % 5

Question 12. 150,000 points

- Consider a hash table of size 100.
- Which hash function produces the fewest number of collisions for keys 10, 20, 30, 40, 50, and 60?

A	key % 6
B	key % 50

C	key % 10
D	key % 5

The correct answer is B.

Question 13. 250,000 points

- How many times do we call *siftDown* (*percolateDown*) while sorting the following array using heapsort?

47	54	60	25	36	13	90
----	----	----	----	----	----	----

A	6
B	9

C	12
D	18

Question 13. 250,000 points

- How many times do we call *siftDown* (*percolateDown*) while sorting the following array using heapsort?

47	54	60	25	36	13	90
----	----	----	----	----	----	----

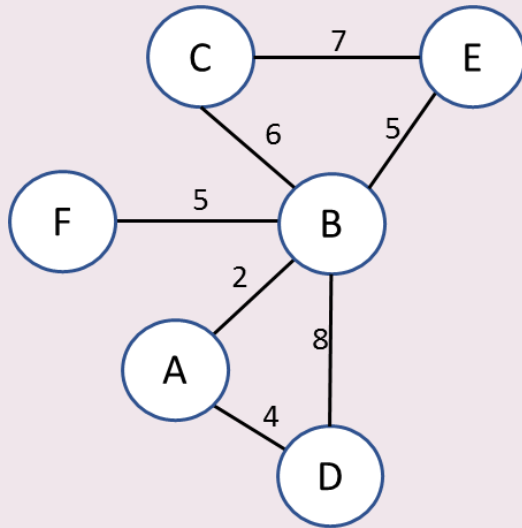
A
B

C
D

The correct answer is B.

Question 14. 500,000 points

- What is the DGS of nodes C,D,E,F in the next iteration of the Dijkstra's algorithm?



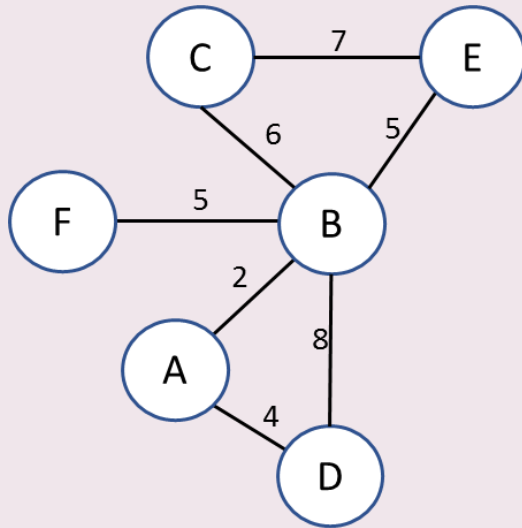
	Iteration 1		Iteration 2	
	X	V-X	X	V-X
	cost	DGS	cost	DGS
A	0		0	
B		2	2	
C		∞		?
D		4		?
E		∞		?
F		∞		?

A	C:6, D:8, E:5, F:5
B	C:8, D:13, E:7, F:7

C	C:8, D:4, E:7, F:7
D	C:6, D:4, E:5, F:5

Question 14. 500,000 points

- What is the DGS of nodes C,D,E,F in the next iteration of the Dijkstra's algorithm?



	Iteration 1		Iteration 2	
	X	V-X	X	V-X
	cost	DGS	cost	DGS
A	0		0	
B		2	2	
C		∞		8
D		4		4
E		∞		7
F		∞		7

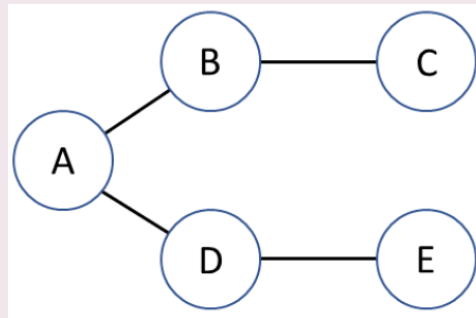
A	C:6, D:8, E:5, F:5
B	C:8, D:13, E:7, F:7

C	C:8, D:4, E:7, F:7
D	C:6, D:4, E:5, F:5

The correct answer is C.

Question 15. One million points!

- Identify the order in which the vertices are discovered and processed during a (**recursive**) **DFS** traversal of the following graph starting with vertex A.

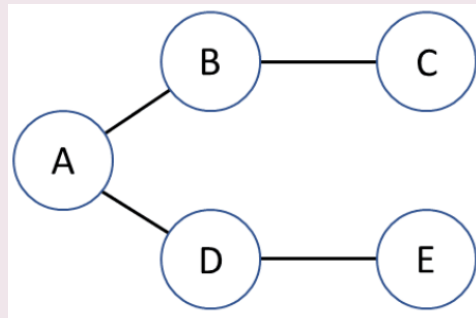


A	Discovery: ABCDE Processing: EDCBA
B	Discovery: ABDCE Processing: ECDDBA

C	Discovery: ABCDE Processing: CBEDA
D	Discovery: ABCDE Processing: ABCDE

Question 15. One million points!

- Identify the order in which the vertices are discovered and processed during a (recursive) DFS traversal of the following graph starting with vertex A.



A	Discovery: ABCDE Processing: EDCBA
B	Discovery: ABDCE Processing: ECDBA

C	Discovery: ABCDE Processing: CBEDA
D	Discovery: ABCDE Processing: ABCDE

The correct answer is C.

Well done!

You are almost ready for the final exam