IN-CLASS EXERCISE (I2)

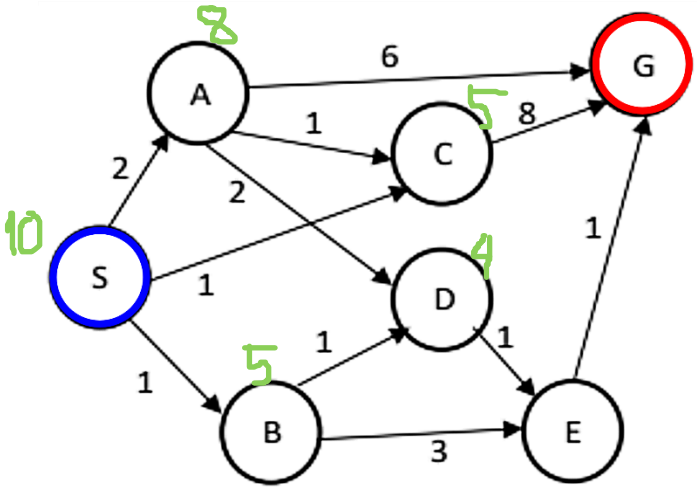
Duration: 15 mins

Date: 02/03/2023

Score: ..... / 3

Student ID:..... Student name: .....

Question 1 (2pts) Consider the following graph. The initial state is **vertex S**, and the goal state is **vertex G**. The heuristic table is shown aside the graph. **Ties are broken in alphabetical order**.



Vertex	Heuristic
S	10
A	8
B	5
C	5
D	4
E	2
G	0

For each of the following search strategies, state the order in which states are expanded and the path returned. Vertices should be presented in their exact order without spaces in between, e.g., SABC)
Note that the path returned will not be accepted if the list of expanded states is wrong.

Algorithm	**List of expanded states in exact order**	**Path returned**
Uniform cost search (1pt)		
Iterative deepening search (0.5pt)	Level 0: Level 1: Level 2:	
Graph-search GBFS (0.5pt)		

Question 2 (1pt) Check whether the heuristic given in Question 1 is admissible or not. If not, point out **all** the vertices that violate the admissibility.

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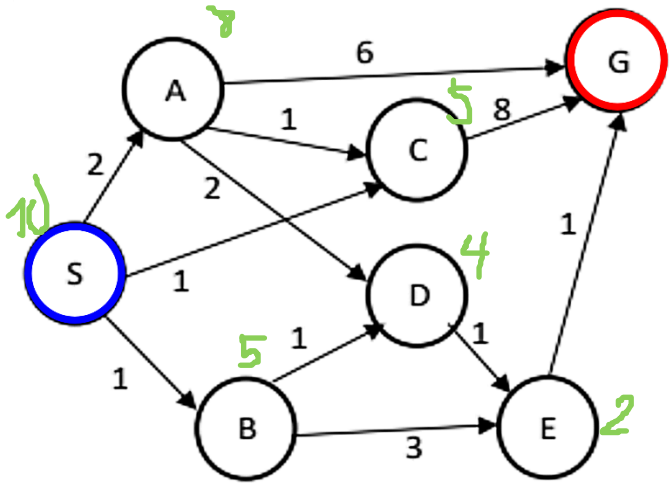

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Depth-first search (0.5pt) avoid repeating any state on the current path		
Breadth-first search (0.5pt)		

Question 2 (1pt) The heuristic given in Question 1 is inconsistent. Point out **at least two** pairs of vertices that violate the consistency.

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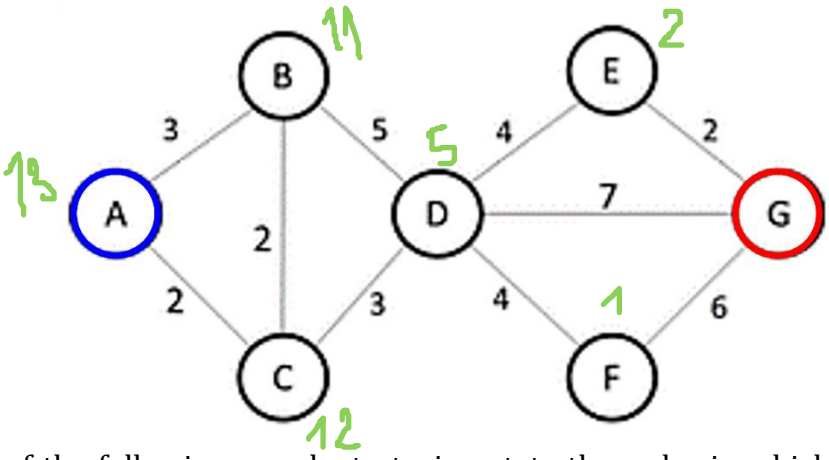

Vertex	Heuristic
A	13
B	11
C	12
D	5
E	2
F	1
G	0

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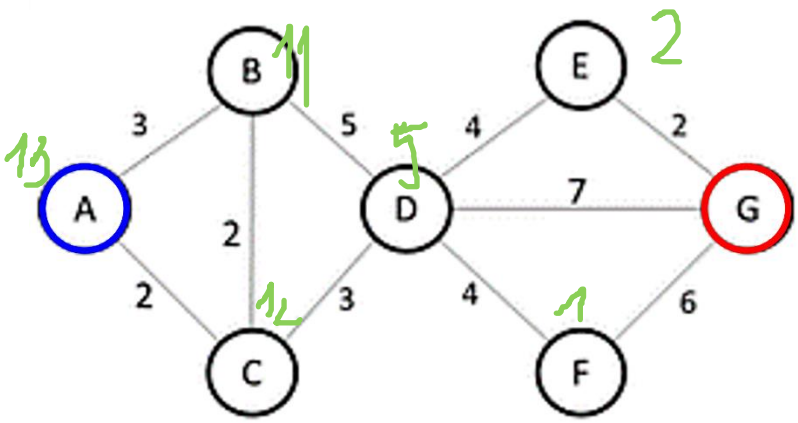

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SOLUTION

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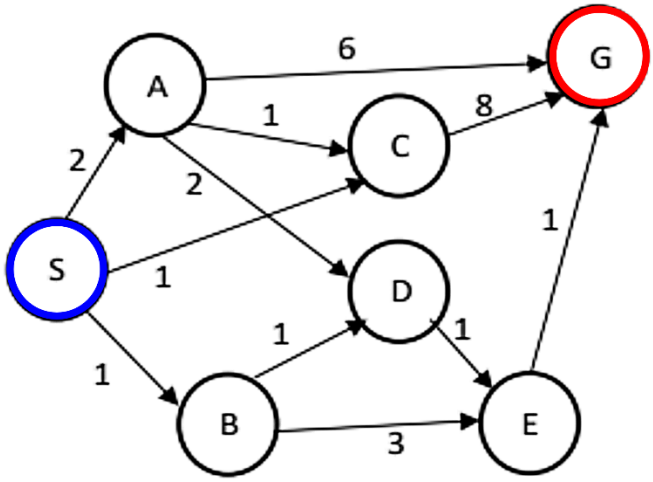

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A	8
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Note that the path returned will not be accepted if the list of expanded states is wrong.

Algorithm	**List of expanded states in exact order**	**Path returned**
Uniform cost search (1pt)	S B C A D E G	S B D E G
Iterative deepening search (0.5pt)	Level 0: S Level 1: S A B C Level 2: S A	S A G
Graph-search GBFS (0.5pt)	S B E	S B E G

Question 2 (1pt) Check whether the heuristic given in Question 1 is admissible or not. If not, point out **all** the vertices that violate the admissibility.

Inadmissible. Vertices are S, A, B, D, and E. h(S) = 10 > c*(S, G) = 4, h(A) = 8 > c*(A, G) = 6, h(B) = 5 > c*(B, G) = 3, h(D) = 4 > c*(D, G) = 2, h(E) = 2 > g*(E, G) = 1.

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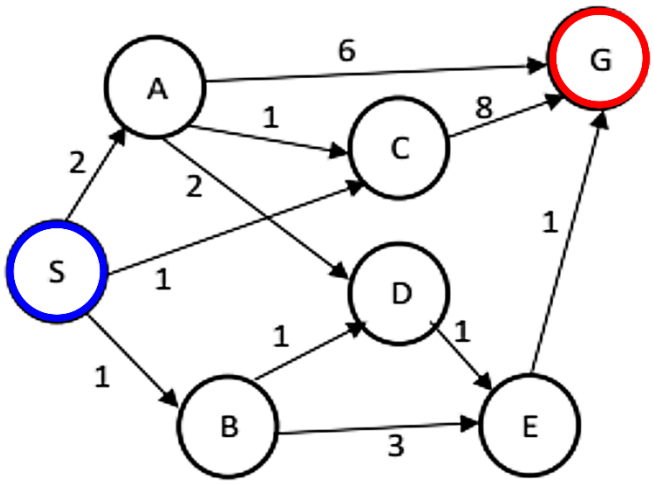

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Note that the path returned will not be accepted if the list of expanded states is wrong.

Algorithm	**List of expanded states in exact order**	**Path returned**
Graph-search A* (1pt)	S B C D E G	S B D E G
Depth-first search (0.5pt) avoid repeating any state on the current path	S A	S A G
Breadth-first search (0.5pt)	S A	S A G

Question 2 (1pt) The heuristic given in Question 1 is inconsistent. Point out **at least two** pairs of vertices that violate the consistency.

D-E and A-D. h(D) = 4 > c(D, E) + h(E) = 1 + 2 = 3. h(A) = 8 > c(A, D) + h(D) = 2 + 4 = 6

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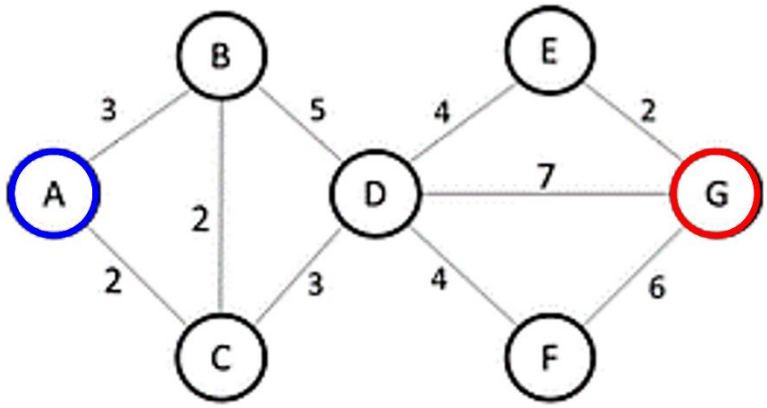

Vertex	Heuristic
A	13
B	11
C	12
D	5
E	2
F	1
G	0

For each of the following search strategies, state the order in which states are expanded and the path returned. Vertices should be presented in their exact order without spaces in between, e.g., SABC)
Note that the path returned will not be accepted if the list of expanded states is wrong.

Algorithm	**List of expanded states in exact order**	**Path returned**
Uniform cost search (1pt)	A C B D E F G	A C D E G
Iterative deepening search (0.5pt)	Level 0: A Level 1: A B C Level 2: A B C D C B D	A B D G
Graph-search GBFS (0.5pt)	A B D	A B D G

Question 2 (1pt) Check whether the heuristic given in Question 1 is admissible or not. If not, point out **all** the vertices that violate the admissibility.
Inadmissible. Vertices are A and C. h(A) = 13 > c*(A, G) = 11, h(C) = 12 > c*(C, G) = 9

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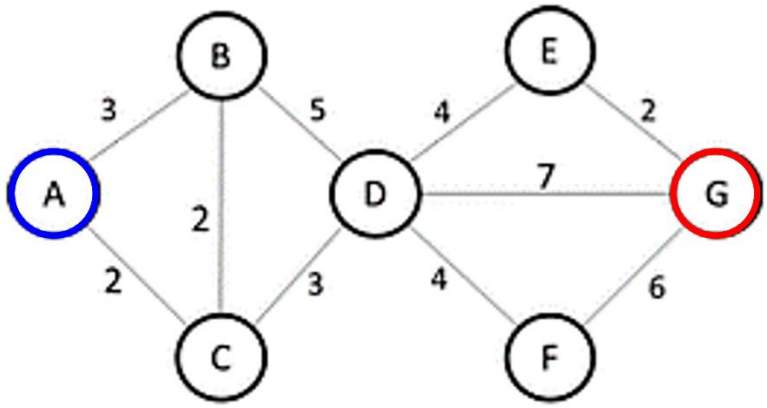

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For each of the following search strategies, state the order in which states are expanded and the path returned. Vertices should be presented in their exact order without spaces in between, e.g., SABC)
Note that the path returned will not be accepted if the list of expanded states is wrong.

Algorithm	**List of expanded states in exact order**	**Path returned**
Graph-search A* (1pt)	A B D F C E G	A B D E G
Depth-first search (0.5pt) avoid repeating any state on the current path	A B C D	A B C D G
Breadth-first search (0.5pt)	A B C D	A B D G

Question 2 (1pt) The heuristic given in Question 1 is inconsistent. Point out **at least two** pairs of vertices that violate the consistency.

B-D and C-D. h(B) = 11 > c(B, D) + h(D) = 5 + 5 = 10, h(C) = 12 > c(C, D) + h(D) = 3 + 5 = 8