Prim's Algorithm Questions

Prim's Algorithm MCQ Question 1

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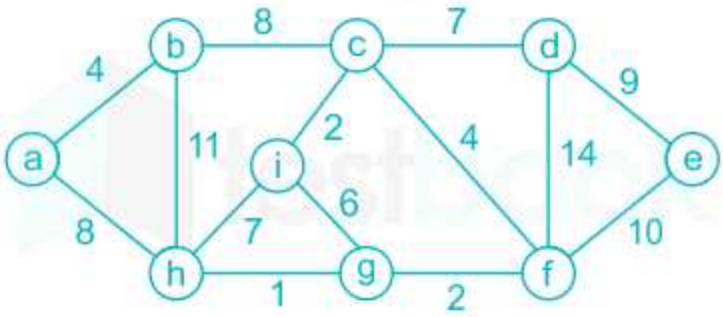
Consider the undirected graph below:



Using Prim's algorithm to construct a minimum spanning tree starting with node a, which one of the following sequences of edges represents a possible order in which the edges would be added to construct the minimum spanning tree?

1. (a, b), (b, h), (g, h), (f, g), (c, f), (c, i), (c, d), (d, e)
2. (a, b), (b, h), (g, h), (g, i), (c, i), (c, f), (c, d), (d, e)
3. (a, b), (b, c), (c, i), (c, f), (f, g), (g, h), (c, d), (d, e)
4. (a, b), (g, h), (g, f), (c, f), (c, i), (f, e), (b, c), (d, e)

Answer (Detailed Solution Below)

Option 3 : (a, b), (b, c), (c, i), (c, f), (f, g), (g, h), (c, d), (d, e)

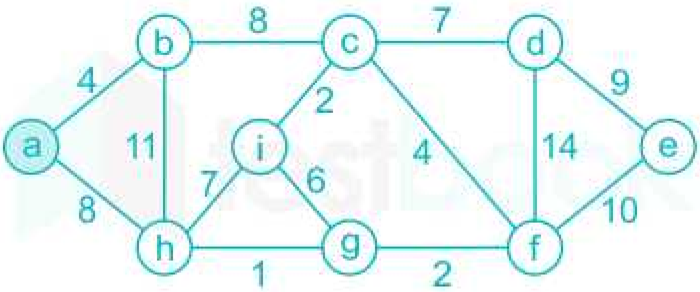
Prim's Algorithm MCQ Question 1 Detailed Solution

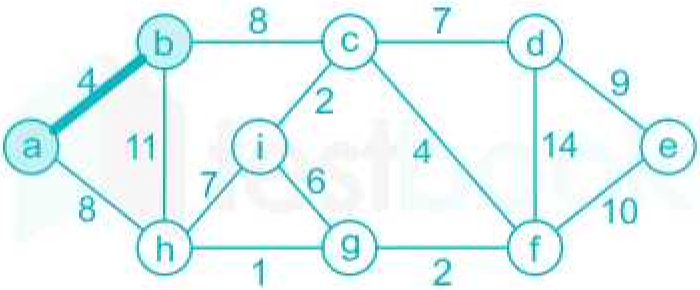
The correct answer is **option 1 and option 3.**

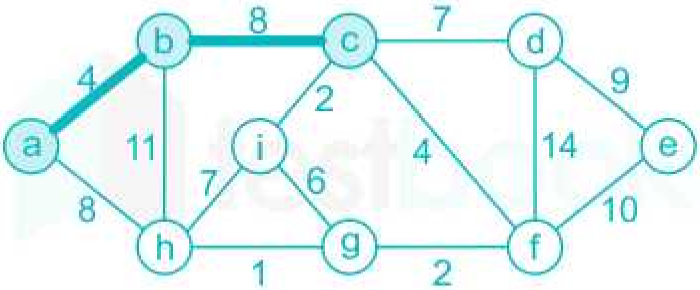
Concept:

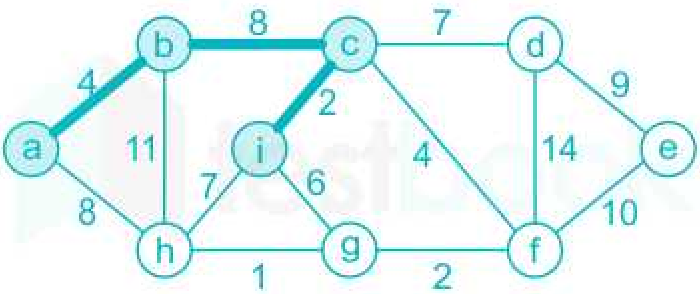
A minimum spanning tree (MST) or minimum weight spanning tree is a subset of the edges(V − 1) of a connected, edge-weighted undirected graph G(V, E) that connects all the vertices together, without any cycles and with the minimum possible total edge weight.

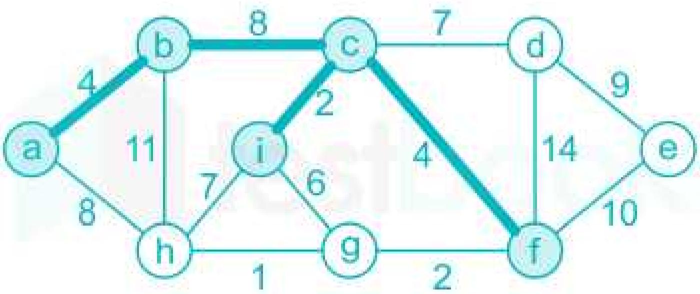
Key Points

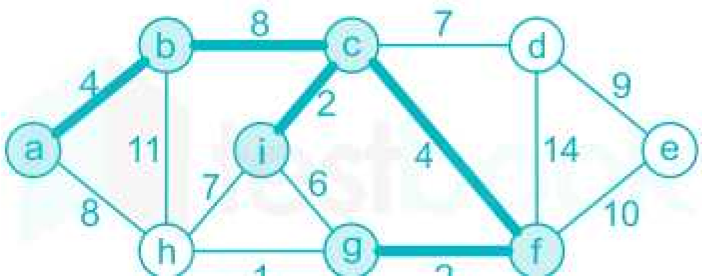


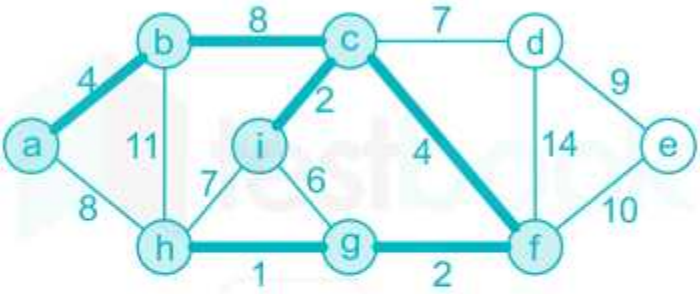


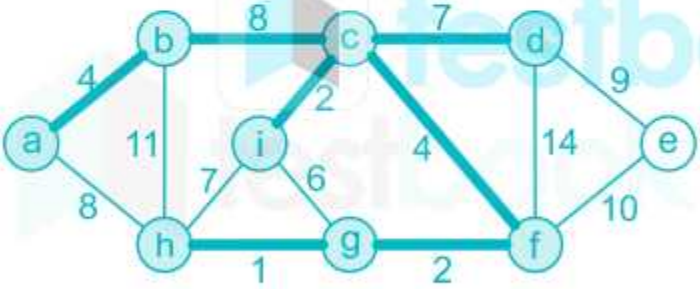


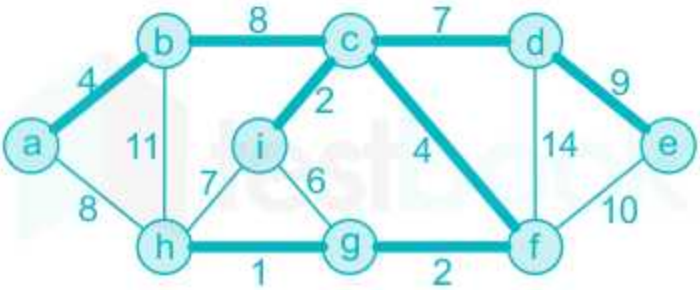




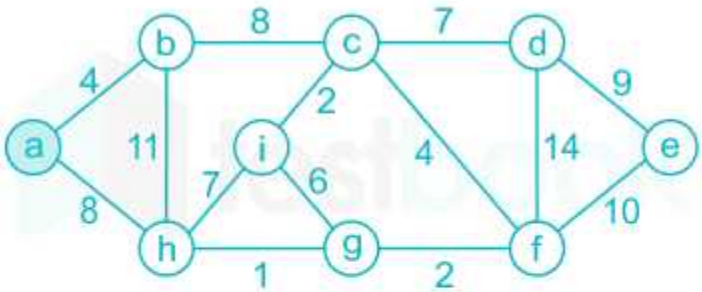


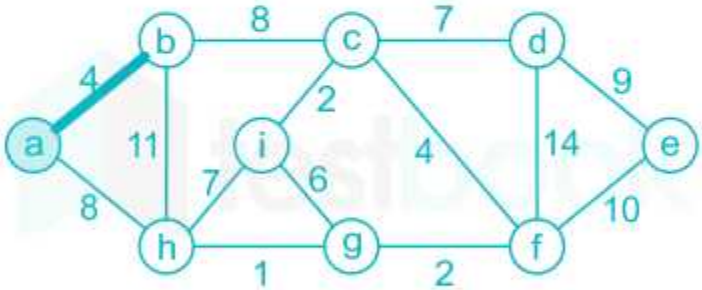


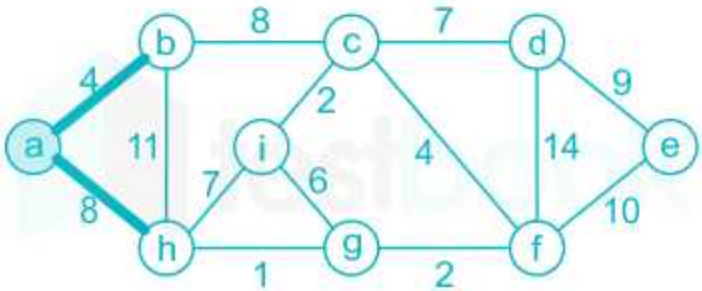


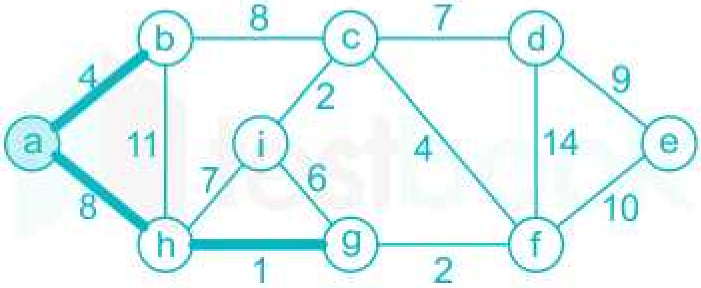


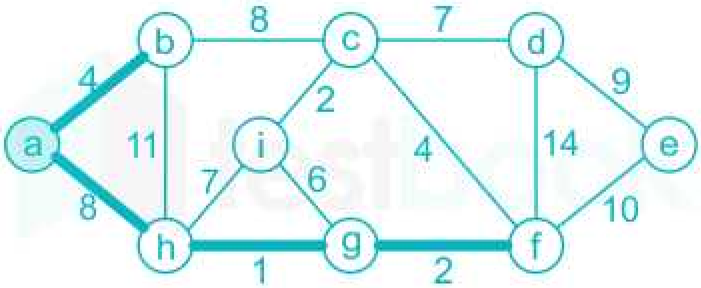
The final sequence will be (a, b), (b, c), (c, i), (c, f), (f, g), (g, h), (c, d), (d, e) with a cost 37.

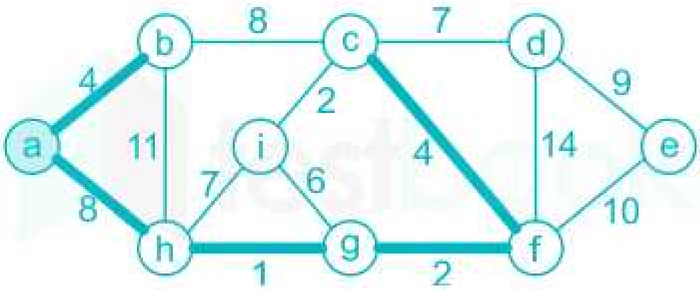


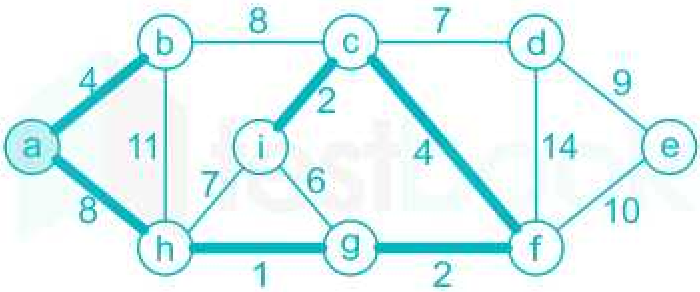


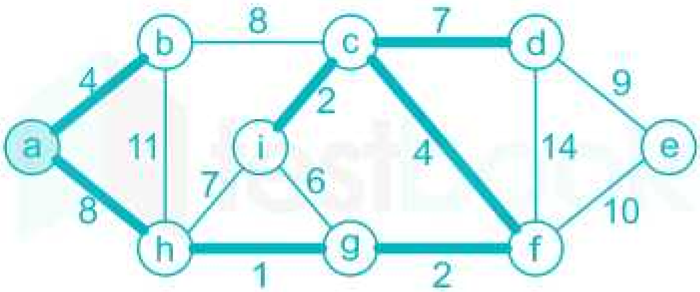


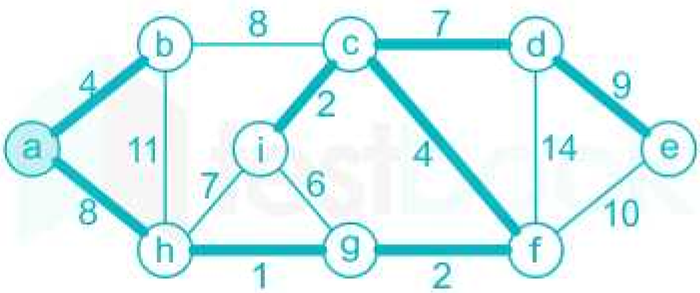












Another final sequence is (a, b), (a, h), (g, h), (f, g), (c, f), (c, i), (c, d), (d, e) with a cost is 37(Two

sequences possible).

Prim's Algorithm MCQ Question 2

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Which of the following statement is false about Prim's algorithm?

1. Initially the roots key and nodes are initialized to zero.
2. The complexity is O(E log V) using binary heap
3. The time complexity is O(E + V log V)using Fibonacci Heap
4. It may use binomial max heap to represent the priority queue

Answer (Detailed Solution Below)

Option 4 : It may use binomial max heap to represent the priority queue

Prim's Algorithm MCQ Question 2 Detailed Solution

Concept:

- The first step of prim's algorithm: Initially the roots key and nodes are initialized to zero
- Prim's algorithm can be implemented without binary heap in O (V^2)
- Prim's algorithm can be implement with binary heap in : O (V log V)+ O(E log V) + O (E) = O (E log V)

- Prim's algorithm can be implemented with a Fibonacci heap is: O(V log V + O (E))
- Prim's algorithm doesn't use binomial max heap to represent the priority queue.

Hence option 4 statement is false.

Prim's Algorithm MCQ Question 3

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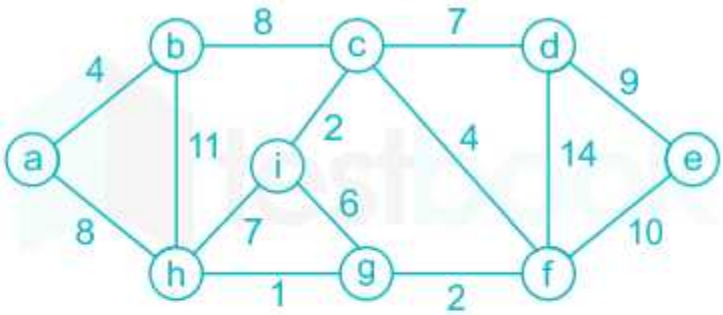
Consider the undirected graph below:



Using Prim's algorithm to construct a minimum spanning tree starting with node a, which one of the following sequences of edges represents a possible order in which the edges would be added to construct the minimum spanning tree?

1. (a, b), (b, h), (g, h), (f, g), (c, f), (c, i), (c, d), (d, e)
2. (a, b), (b, h), (g, h), (g, i), (c, i), (c, f), (c, d), (d, e)
3. (a, b), (b, c), (c, i), (c, f), (f, g), (g, h), (c, d), (d, e)
4. (a, b), (g, h), (g, f), (c, f), (c, i), (f, e), (b, c), (d, e)

Answer (Detailed Solution Below)

Option 3 : (a, b), (b, c), (c, i), (c, f), (f, g), (g, h), (c, d), (d, e)

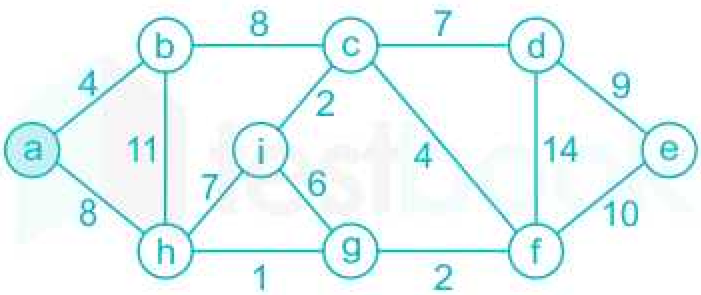
Prim's Algorithm MCQ Question 3 Detailed Solution

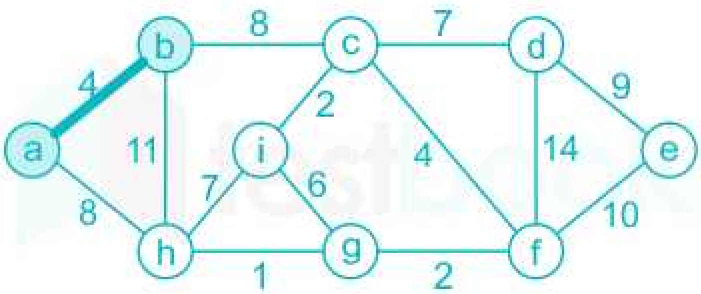
The correct answer is **option 1 and option 3.**

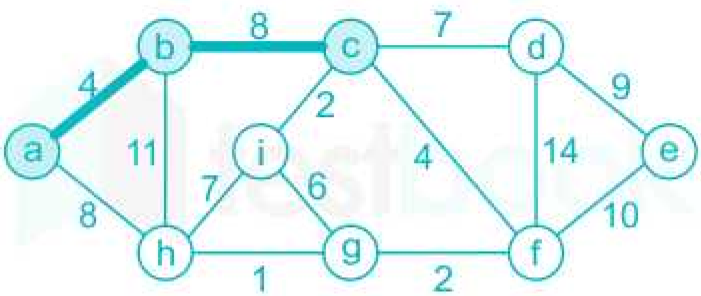
Concept:

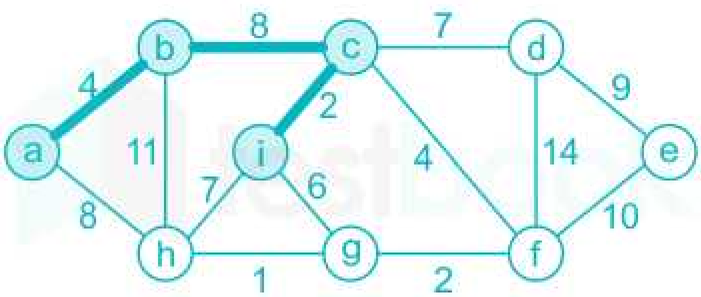
A minimum spanning tree (MST) or minimum weight spanning tree is a subset of the edges(V − 1) of a connected, edge-weighted undirected graph G(V, E) that connects all the vertices together, without any cycles and with the minimum possible total edge weight.

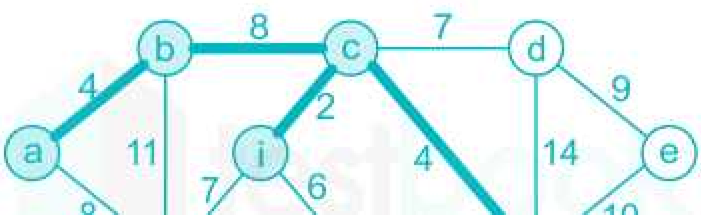
Key Points

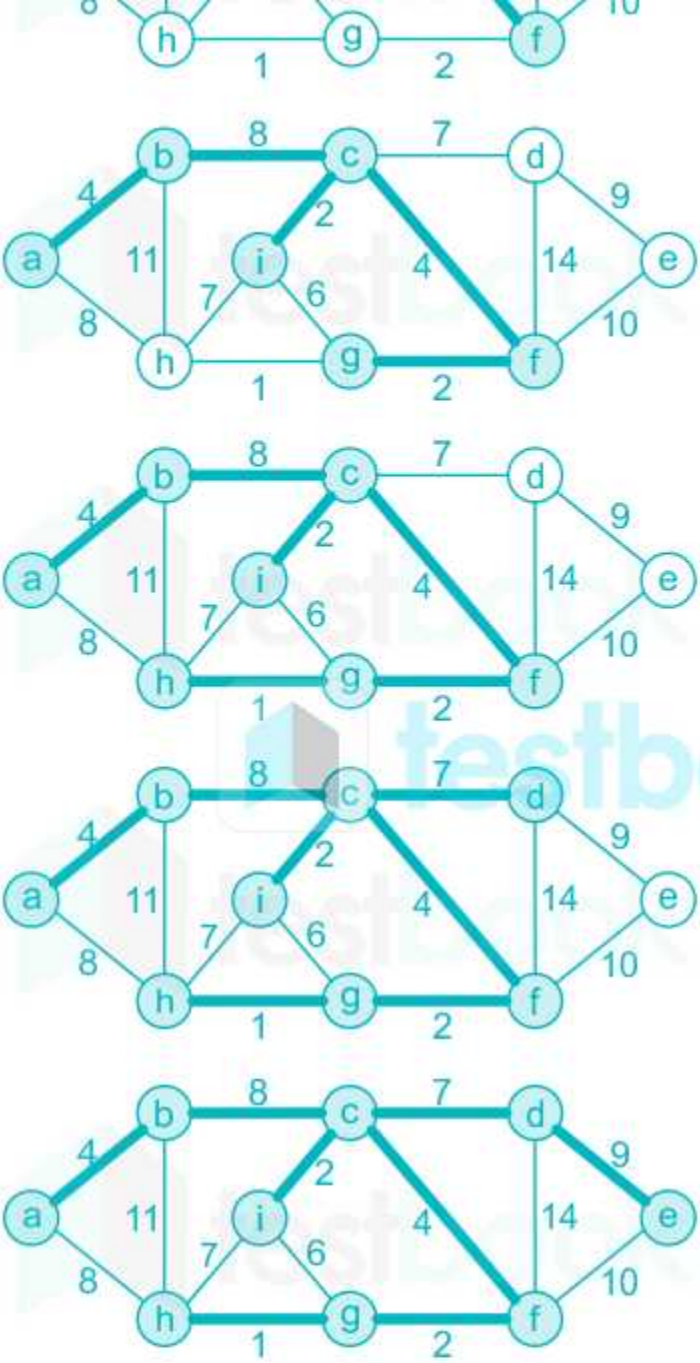




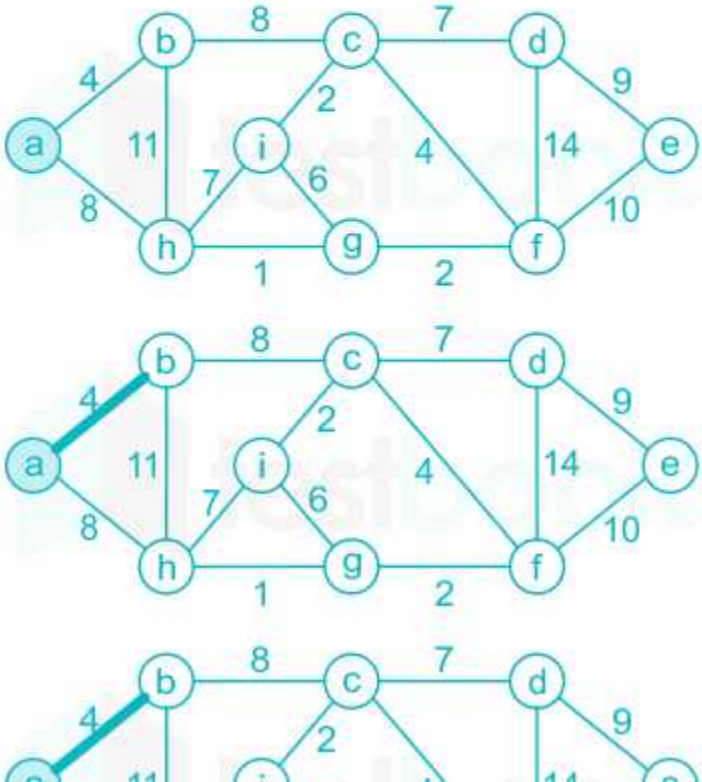








The final sequence will be (a, b), (b, c), (c, i), (c, f), (f, g), (g, h), (c, d), (d, e) with a cost 37.




a
11
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4
14
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7
6
8
10
h
g
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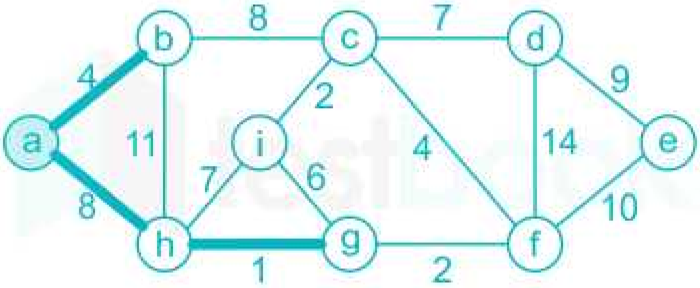
1
2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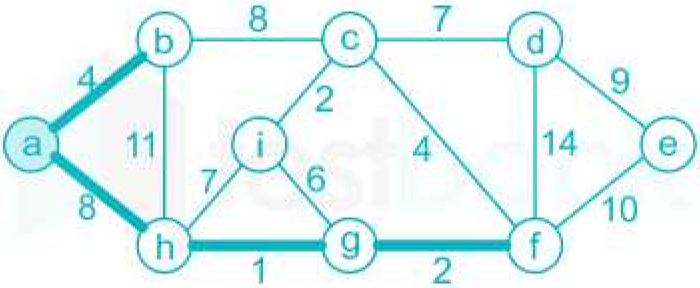
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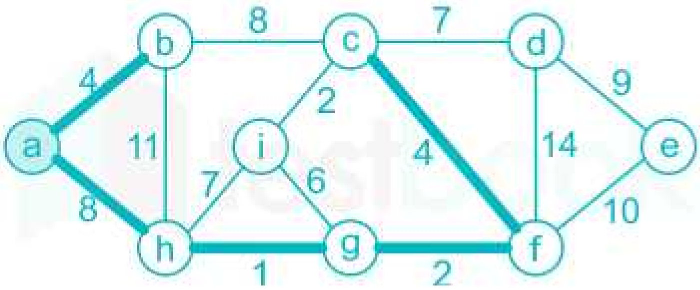
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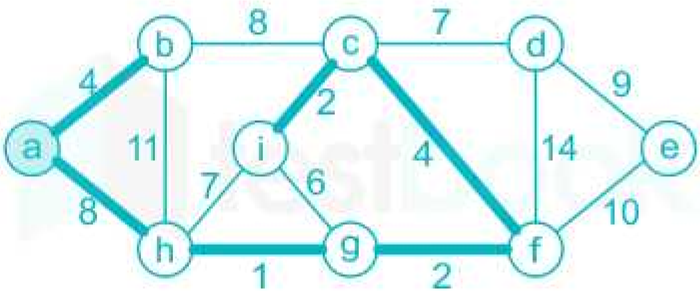
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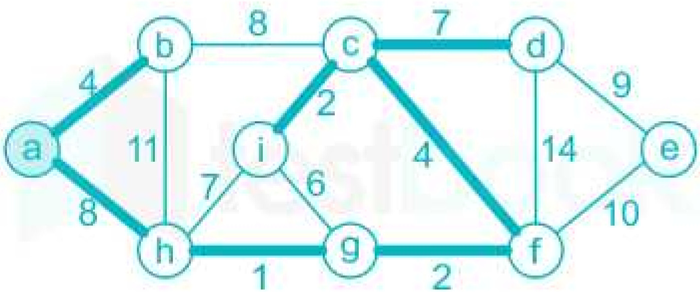
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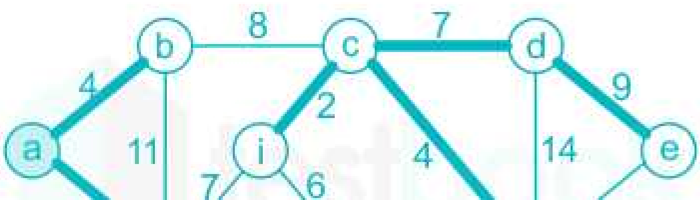
b
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a
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i
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14
e
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6

Another final sequence is (a, b), (a, h), (g, h), (f, g), (c, f), (c, i), (c, d), (d, e) with a cost is 37(Two sequences possible).

Prim's Algorithm MCQ Question 4

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Which of the following statement is false about Prim's algorithm?

1. Initially the roots key and nodes are initialized to zero.
2. The complexity is O(E log V) using binary heap
3. The time complexity is O(E + V log V)using Fibonacci Heap
4. It may use binomial max heap to represent the priority queue

Answer (Detailed Solution Below)

Option 4 : It may use binomial max heap to represent the priority queue

Prim's Algorithm MCQ Question 4 Detailed Solution

Concept:

- The first step of prim's algorithm: Initially the roots key and nodes are initialized to zero
- Prim's algorithm can be implemented without binary heap in O (V^2)
- Prim's algorithm can be implement with binary heap in : O (V log V)+ O(E log V) + O (E) = O (E log V)
- Prim's algorithm can be implemented with a Fibonacci heap is: O(V log V + O (E))
- Prim's algorithm doesn't use binomial max heap to represent the priority queue.

Hence option 4 statement is false

Hence option 4 statement is false.

Prim's Algorithm MCQ Question 5

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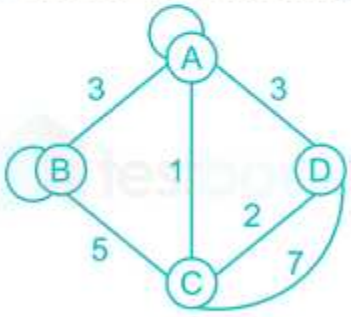
Consider the following undirected weighted graph:



Which of the following edges represents the correct execution of Prim's algorithm to construct an MST?

1. (A, B), (A, C), (C, D)

2. (A, D), (A, C), (C, D)

3. (A, B), (A, D), (C, D)

4. (A, D), (A, C), (C, B)

Answer (Detailed Solution Below)

Option 1 : (A, B), (A, C), (C, D)

Prim's Algorithm MCQ Question 5 Detailed Solution

Remove the loops and parallel edges except for the edge with minimum weight. Here, edge CD with weight 7 will be removed.

	A	B	C	D
A	0	**3**	**1**	3
B	**3**	0	5	∞
C	**1**	5	0	**2**
D	3	∞	**2**	0

Prim's Algorithm MCQ Question 6

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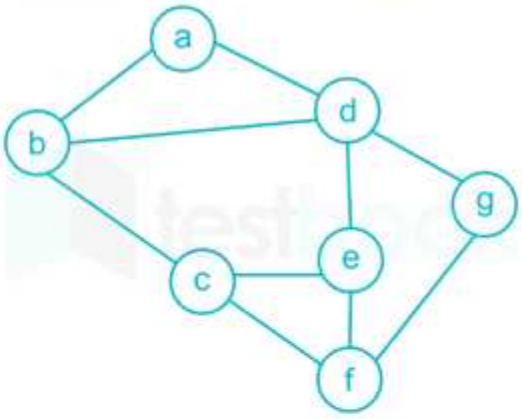
Consider the following graph:



Which of the following is the possible sequence of edges when Prim's algorithm is applied ?

1. (a,b),(b,c),(a,d),(e,f),(d,g),(c,e)
2. (g,f),(f,c),(g,d),(c,e),(d,b),(d,a)
3. (c,f),(c,e),(e,d),(a,b),(d,g),(b,c)
4. None of the above

Answer (Detailed Solution Below)

Option 2 : (g,f),(f,c),(g,d),(c,e),(d,b),(d,a)

Prim's Algorithm MCQ Question 6 Detailed Solution

We know that Prim's algorithm does not make a disconnected graph, so while while generating the minimum spanning tree, newly added edge should be connected to to the previously connected edges.

Hence sequence in option 2 is the only possible sequence.

Prim's Algorithm MCQ Question 7

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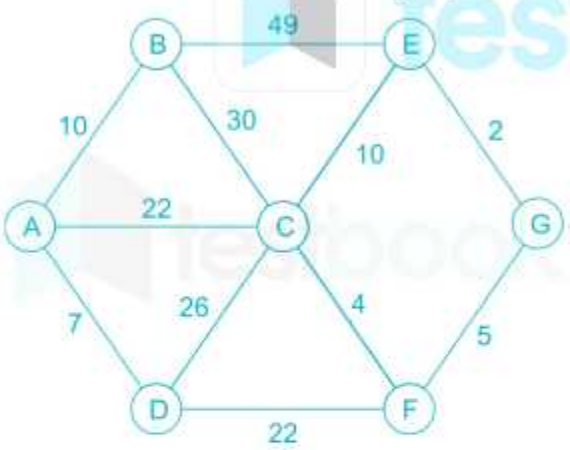
Consider the undirected graph below :



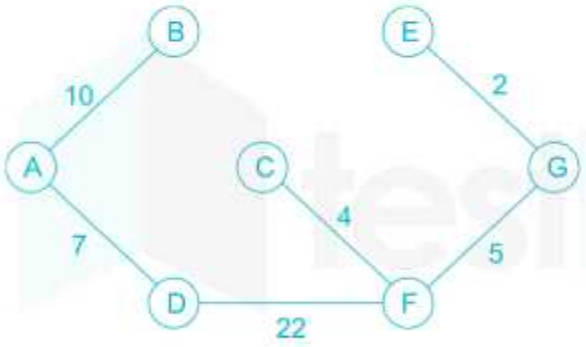
Using Prim's algorithm to construct a minimum spanning tree.
Which one of the following sequences of edges represents a possible order in which the edges would be added to construct the minimum spanning tree ?

1. (E,G) (C,F) (F,G) (A,D) (A,B) (A,C)
2. (E,G) (G,F) (F,C) (F,D) (D,A) (A,B)
3. (A,B) (A,D) (D,F) (F,G) (G,E) (F,C)
4. (A,D) (A,B) (D,F) (F,C) (F,G) (G,B)

Answer (Detailed Solution Below)

Option 2 : (E,G) (G,F) (F,C) (F,D) (D,A) (A,B)

Prim's Algorithm MCQ Question 7 Detailed Solution



EG	E : ~~2~~, 10, 49
GF	G : ~~2~~, ~~5~~
FC	F : ~~4~~, ~~5~~, ~~22~~
FD	C : ~~4~~, 10, 22, 26, 30
DA	D : ~~7~~, ~~22~~, 26
AB	A : ~~7~~, ~~10~~, 22
	B : ~~10~~, 30, 49

So the order of adding edge is,

(E,G) (G,F) (F,C) (F,D) (D,A) (A,B)

Prim's Algorithm MCQ Question 8

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Which of the following statements are false ?
(P) : Prims method always maintain tree structure at every level.
(Q) : Both Prim's and Kruskal's generate the same MST for all kind of graphs.
(R) : Kruskal's method maintains connectivity at each level whereas Prim's method may not.
(S) : Time complexity of Prim's method is O (e log e) whereas the time complexity of Kruskal's method is O(n2)
(T) : Spanning tree has a wide application in network routing.

1. P, Q, T
2. Q,R,S
3. R, S, T
4. all of P, Q, R,S, T

Answer (Detailed Solution Below)

Option 2 : Q,R,S