Register for Certification exam (https://examform.nptel.ac.in/2023_01/exam_form/dashboard)

Course outline

How does an NPTEL online course work? ()

Week 0 ()

Week 1 ()

Week 2 ()

Week 3 ()

Week 4 ()

Week 5 ()

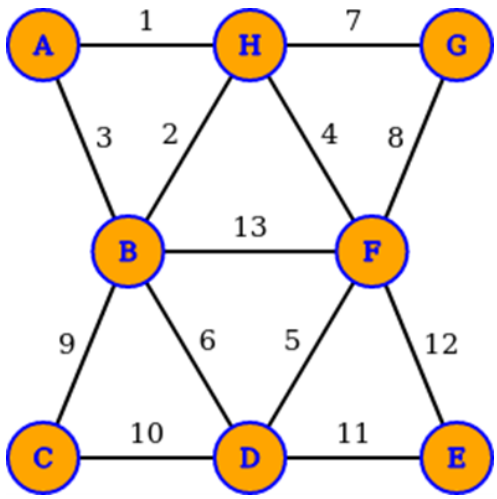
Week 6 ()

Week 7 ()

Week 7: Assignment 7

Your last recorded submission was on 2023-03-15, 11:24 IST Due date: 2023-03-15, 23:59 IST.

1) Consider the graph **G** given below.



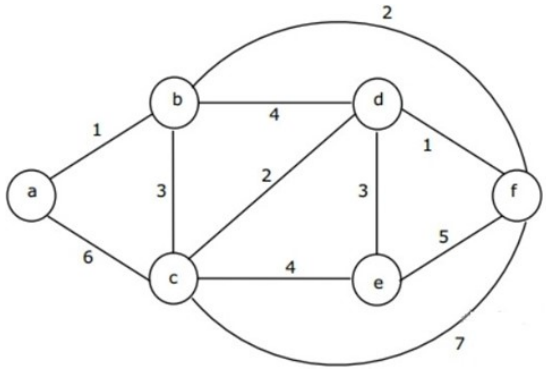
Let α denote the number of minimum spanning trees of G and β denote the weight of such a minimum spanning tree.

The value of $\alpha + \beta$ is _____.

40

1 point

2) Consider the graph shown below. ***1 point***



Which one of the following can be the sequence of edges added, in that order, to create a minimum spanning tree using Kruskal's algorithm?

- [x] (a,b) (d,f) (b,f) (d,c) (d,e)
- [x] (a,b) (d,f) (d,c) (b,f) (d,e)
- [x] (d,f) (a,b) (d,c) (b,f) (d,e)
- [ ] (d,f) (a,b) (b,f) (d,e) (b,c)
- [x] (d,f) (a,b) (b,f) (d,c) (d,e)
- [ ] (d,f) (a,b) (b,f) (d,c) (b,c)

3) Consider the following algorithm on a connected weighted graph with n vertices and m edges. ***1 point***

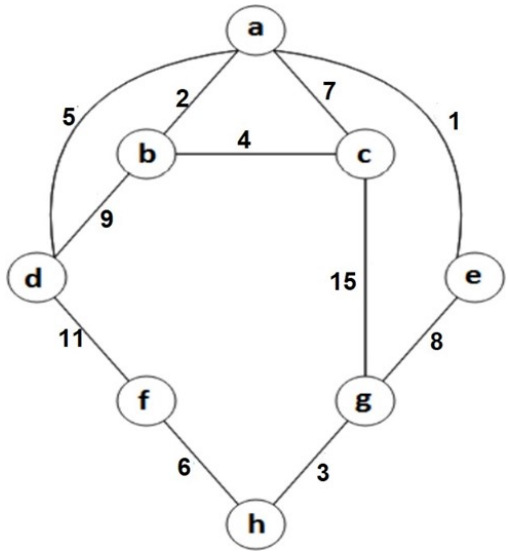
- Sort the edges as [E1, E2, . . . , Em] in decreasing order of weight.
- Consider each edge Ej in sorted order.
- If this edge is part of a cycle, then delete it. Otherwise, keep it in the resulting graph.

Which of the following statements is/are true?

- [x] Exactly m − n + 1 edges will be deleted.
- [ ] At most n − 1 edges will be deleted.
- [x] After processing all m edges, the resulting graph is connected.
- [ ] What remains at the end is a minimum cost spanning tree.
- [x] After processing all m edges, the resulting graph has exactly n - 1 edges.

4) For the undirected, weighted graph given below, which of the following sequences of edges represents a correct execution of **Prim's algorithm** started with vertex a to construct a ***1 point***

Minimum Spanning Tree?



- (a, e), (a, b), (b, c), (a, d), (g, h), (f, h), (e, g)
- (a, e), (a, b), (b, c), (a, d), (e, g), (g, h), (f, h)
- (a, e), (a, b), (g, h), (b, c), (a, d), (f, h), (e, g)
- (a, e), (a, b), (g, h), (b, c), (a, d), (f, h), (a, c)

5) Suppose we run Prim's algorithm and Kruskal's algorithm on a graph G which have edges with distinct weights and these two algorithms produce minimum-cost spanning trees T_P and T_K, with total minimum cost C_p and C_k respectively. Which of the following is **true**? ***1 point***

- T_P and T_K are always the same but C_p may not be equal to C_k
- T_P may be different to T_K but C_p is always equal to C_k
- T_P and T_K are always the same and C_p is always equal to C_k
- T_P may be different to T_K and C_p may not be equal to C_k

6) Let G be a complete undirected graph on 4 vertices, having 6 edges with weights being 1, 2, 3, 4, 5, and 6. The maximum possible weight that a minimum weight spanning tree of G can have is __.

6

1 point

7) Let G = (V, E) is an undirected graph having distinct positive edge weights. Let V be partitioned into two non-empty sets X and Y. Let e = (s, t) be the minimum cost edge, with s belonging to X and t belonging to Y. Which one of the following is true? ***1 point***

- Graph G has multiple MCSTs, every MCST must include edge e
- Graph G has multiple MCSTs, every MCST must exclude edge e
- Graph G has only one MCST, which must include edge e

- ○ Graph G has only one MCST, which must exclude edge e

8) Let G be a connected graph with at least 5 vertices and all edges in G having distinct weights. Let T be a minimum spanning tree of G. Consider the following statements: ***1 point***

1. If e is the heaviest edge in a cycle in G, then T must exclude e.
2. If e is the lightest edge in a cycle in G, then T must include e.
3. If e_3 and e_4 are the third and fourth smallest edges in G, then T must include at least one of them.

Which of the above statement(s) is/are correct regarding G and T?

- ○ Statement 1 only
- ○ Statement 3 only
- ○ Statements 1 and 2
- ◉ Statements 1 and 3

You may submit any number of times before the due date. The final submission will be considered for grading.

Submit Answers