

CSE312-L: DSA

The LNMIIT, Rupa-ki-Nangal, Jaipur 302031

Training Set 10

This training set is prepared for 2021 and later years. In year 2020, we do not have enough training sessions to set a time for this set.

This is continuation of shortest path training set completed previously (Training Set 09). In the previously completed set, distances from LNMIIT to various towns in and around Rajasthan were determined.

Now suppose the students decided to walk from their homes to the institute after summer break. The group that live the farthest will begin the journey back to the campus with the aim of reaching campus on 30 July. The students set a pragmatic target of 35 to 45 kms of walk each day. The students from towns in route will join the group as it travels towards the campus.

When a group arrives in a town, they will be provided food and inhouse rest and sleep facilities by the students in these towns for a night before the bigger group resumes their journey. We all love and appreciate the comforts of a home.

It is common in Rajasthan for pilgrims to walk in this fashion with a truck providing support and medical needs. Students need to reduce cost for hiring truck and support. To this end, groups from different routes will synchronise their walking schedules. Rendezvous will be set at towns where two paths merge. Special celebrations and milans parties will be organised at these locations and groups will stay and celebrate for two nights at these junction towns. Their luggage will be transferred to a single truck to go forward.

You are here to provide IT support to these LNMIITians returning to campus. You must set the dates for each walk between the towns. You have to determine the dates for each hired truck and its start and end location. To do this you have the minimum distances from LNMIIT data printed by the previous training set. You are going to use the data to set schedules.

Training Set 10: Task 01

Your first goal is to build a spanning tree to cover the towns where the students come from. The spanning tree will have roads that are on the shortest paths.

Perform a breadth first scan of the road graph starting from LNMIIT (Rupa ki Nangal) as root. Mark all edges that meet the property:

`town1->finaliseDist - town2->finalisedDist == link->length`, where `link` is a road from `town1` to `town2`.

Training Set 10: Task 02

Now delete all edges from the graph that are not marked by the level-order breadth first search of the towns in and around the state.

Remove any further road, if needed, to get a spanning tree. For each link road, we can determine the number of travel days the walker will need.

Training Set 10: Task 03

Perform suitable depth first searches to mark the junction towns and scheduled departure dates from each town for the adventurers to arrive at LNMIIT campus at the set date. Take note of the fact that the students will celebrate milans at junction towns where two or more groups arrive.

Example 1:

Students starting from town A travel to town B on way to town C. The road from town A to B is 75 kms. Town B is 25 Kms from town C. If students leave town A on 15 July, when will they leave town C for onward trip to LNMIIT, Rupa ki Nangal? None of these three towns are a junction town.

Answer:

It will take 2 days from town A to town B as they cover 37.5 kms each day. The group will be welcomed in town B on 16th evening. They will leave for town C on 17th morning. They arrive at town C the same evening.

Example 2:

Students from town P and town Q travel to junction town J. The distance between P and J is 70 kms. Distance from Q to J 100 kms. The students at town Q left the town on 20th morning. What schedule the students at towns P and J should plan?

Answer:

Students from town Q will need three days and arrive at town J on 22nd evening. They will stay there for 2 nights. All will resume their walk on 24th morning towards the LNMIIT.

Students coming from town P, must set their arrival at J on 22nd and they have 2 days of walk. So they will leave town P on 21st morning towards town J.