Ex :Berlin Tram Map colouring problem. [10 marks] See the pdf file in moodle representing the tram network in the city of Berlin. The tram routes in the city are M1, M2, M4, M5, M6, M8, M10, 12, M13, 16, M17, 18, 21, 27, 37, 50, 60, 61, 62, 63, 67, 68. You can observe that when tram routes intersect at any point in the tram network, they have different colours. This makes is possible to easily track the route of a tram through the network (please try out what would be the difficulty if all routes were depicted with the same colour). The question is how to do this with the minimum number of colours (so that they are all nice and distinct). Think of ways of doing this on your own.

1Answer:

Total 7 colour are needed to colour berlin tram routes.

Let suppose colour are 1,2,3,4,5,6 and 7.

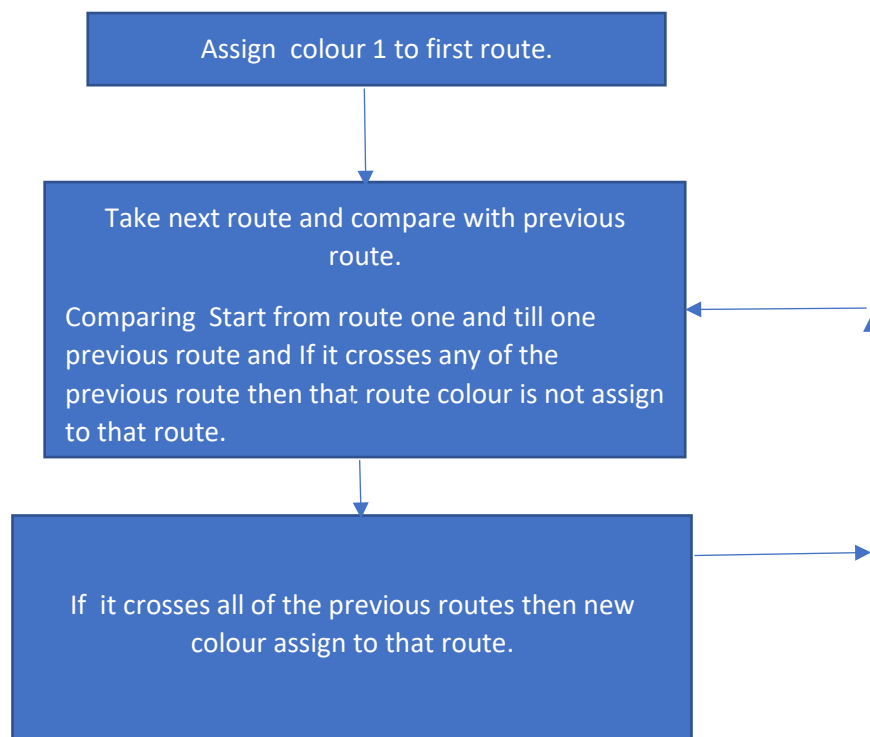| Colour	Route
1	M1,M2,16,18,37,61
2	M4,M17,50,62
3	M5,12,21,63
4	M6,60
5	M8,67
6	M10,27,68
7	M13

2Answer:

Here total 7 colour are needed are to colour the route. And colour are 1,2,3,4,5,6and 7.

- let assign colour 1 to the first route M1 in the given order.
- Now taking second route M2 and check that is it crossing previous route M1 or not. If it crosses M1 then assign new colour to it otherwise give colour same as M1. Here M2 not crosses the route M1. So we assign 1 colour to it.
- Now take route M4, then check that it is crossing previous routes M1 or M2 or not. Here M1 and M2 have same colour and M4 crosses M2, so we assign new colour 2 to M4.
- Now take route M5, then check that it is crossing previous route M1 or M2 or M4 or not. If it is crossing M1 or M2 then we not assign colour 1.if

it is crossing M4 then we not assign colour 2. Here M5 crosses all of the previous route. So new colour 3 assign to M4.

- Now same procedure to next routes. Take one another route then check that it is crossing or not previous route. If it is crossing previous route then that colour of route is not assign and check for next route as same method. If it is crosses all of the previous route then assign new colour to that route.

Using this procedure is follow for any number of route. And we get minimum colour as possible.

Assign colour 1 to first route.

Take next route and compare with previous route.

Comparing Start from route one and till one previous route and If it crosses any of the previous route then that route colour is not assign to that route.

If it crosses all of the previous routes then new colour assign to that route.

5) [R] If we have n routes and there is a route that intersects the other n − 1 routes, then we need n colours to represent the map. True or false? If true, provide a proof, if false, provide a counterexample.

Answer: If we have n routes and there is a route that intersects the other n − 1 routes, then we need n colours to represent the map. This is false statement.

If we have n routes and there is a route that intersect the other n − 1 routes. Then we need minimum two colour to represent the map.

Counter Example:

Lets take 4 routes and in that there is 3 routes which are parallel to each other then 4th route intersect other three parallel line. In that 2 colour need to represent map.