

EX 1Part 1 $[M1, M2, M17, 61] \rightarrow \text{Red}$ $[M5, 12, 50, 18, 21, 62] \rightarrow \text{Green}$ $[M8, 60] \rightarrow \text{Blue}$ $[M10, 16, 67] \rightarrow \text{Purple}$ $[M13, 27, 68] \rightarrow \text{Pink}$ $[M4, 37, 63] \rightarrow \text{Black}$ $[M6] \rightarrow \text{Orange}$ $\rightarrow \text{No. of Glours used} = 7.$ Part 2 ~~Python~~ Python Code is also attached for performing this. ~~*~~Step 1: Make diagonal entries as 0.Step 2 Now in row of M1 under which 1 is present intersects with M1.

Hence, say if possible we group those under which 1 is not written into single group and under which 1 is written into another group. say former group as L1 and latter as L2

$L1 = [M1, M2, M4, M6, 16, M17, 18, 21, 27, 37, 60, 61, 62, 63, 67, 68]$

$L2 = [M5, M8, M10, 12, M13, 50]$

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Step 3) Now from the data remove rows and columns of those routes under which 1 was not present in row 1.

So, we end up having data set / Matrix containing rows and columns of routes in $L2$ only.

Step 4) As we did in step 2 again we can split $L2$ using 1's present in row corresponding to 1st entry of $L2$. and we will get

$L2_1 = [M5, 12, 50]$, $L2_2 = [M8, M10, M13]$

Step 5) Now we will $L3$ as we splitted $L2$ in step 4 we will get

$L3 = [M8]$, $L4 = [M10, M13]$

and again

$L4 = [M10]$, $[M13] = L5$

step 6) We can see that ~~the~~ routes in L_2, L_3, L_4, L_5 have no intersec. with others in their ~~same~~ groups.

step 7) We will, one by one, take ~~each~~ routes from L_1 and try to accomodate them in subsequent group (if allowed by data of intersection).

for ex. take M_2 from L_1 and M_4 from L_1 , ~~now take M_2~~ and check wheather if all of them do not intersect with M_2 & M_4 intersect or not if they then we will ~~not~~ try to move M_4 from L_1 to others. for this take L_2 and check if all of routes in L_2 ~~not~~ do not intersect with M_4 if they do not then put M_4 in L_2 , else take L_3 and check again. When M_4 is allotted to any subsequent group. then start again with another element from L_1 if M_4 is not allotted to any group present then make another group of M_4 only.

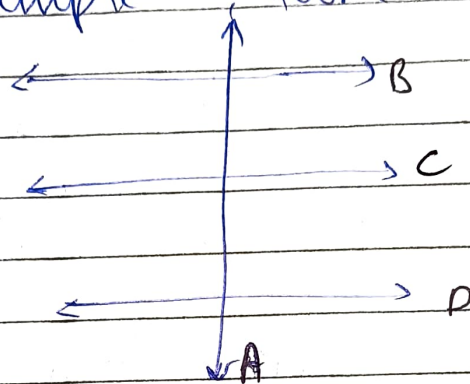
→ we can do this for all L_i 's in step 6 but it is not needed for L_2, L_3, L_4 & L_5 it is clear from data.

step 8) Stop when no one route in any group have intersection with others.

Part ④

It is false.

for example take following network



here we have 4 routes, out of which route A intersects with other 3. (As per ques.)

But we can assign B, C, D same colour and A different to represent a map.