# Division Three

After the interpretation of data from the resources and various outcomes we move to a real-life situation where there is urgent need of doctors and nurses to care the patients suffering from the COVID-19. Since, there is urgency at the hospitals or medical camps or any isolation wards there is no proper record and schedule of working which indirectly reduces work efficiency.

So, we introduce the concept of Scheduling using **Discrete mathematics: Graph Theory** which helps to solve the above problem.

Here, for better understanding we take data on our own and create a table with their respective posts.

| NAME | POST |
|---|---|
| 1. D1 | SR |
| 2. D2 | SR |
| 3. D3 | JR |
| 4. N1 | JR |
| 5. N2 | SR |
| 6. N3 | SR |
| 7. N4 | JR |
| 8. N5 | SR |
| 9. D4 | JR |
| 10. N6 | JR |
| 11. N7 | JR |
| 12. N8 | SR |
| 13. FY1 | FH |
| 14. FY2 | FH |
| 15. FY3 | FH |

D(no.): Doctors N(no.): Nurses FY(no.): Final Year Students

SR: Senior JR: Junior FH: Fresher

Thus, we created a data of 15 members who are going to work in a medical camp..etc..

Considering the different skill levels (based on posts) we need to differentiate all of them into groups with the constraints provided at that time. Those constraints depend on the place, patients and availability.

For example: -

- No Senior should have Junior and Fresher (If possible).
- There should be 3 shifts: Morning, Afternoon and Night.

- There should be at least one day in a week even if they are not in night shift.

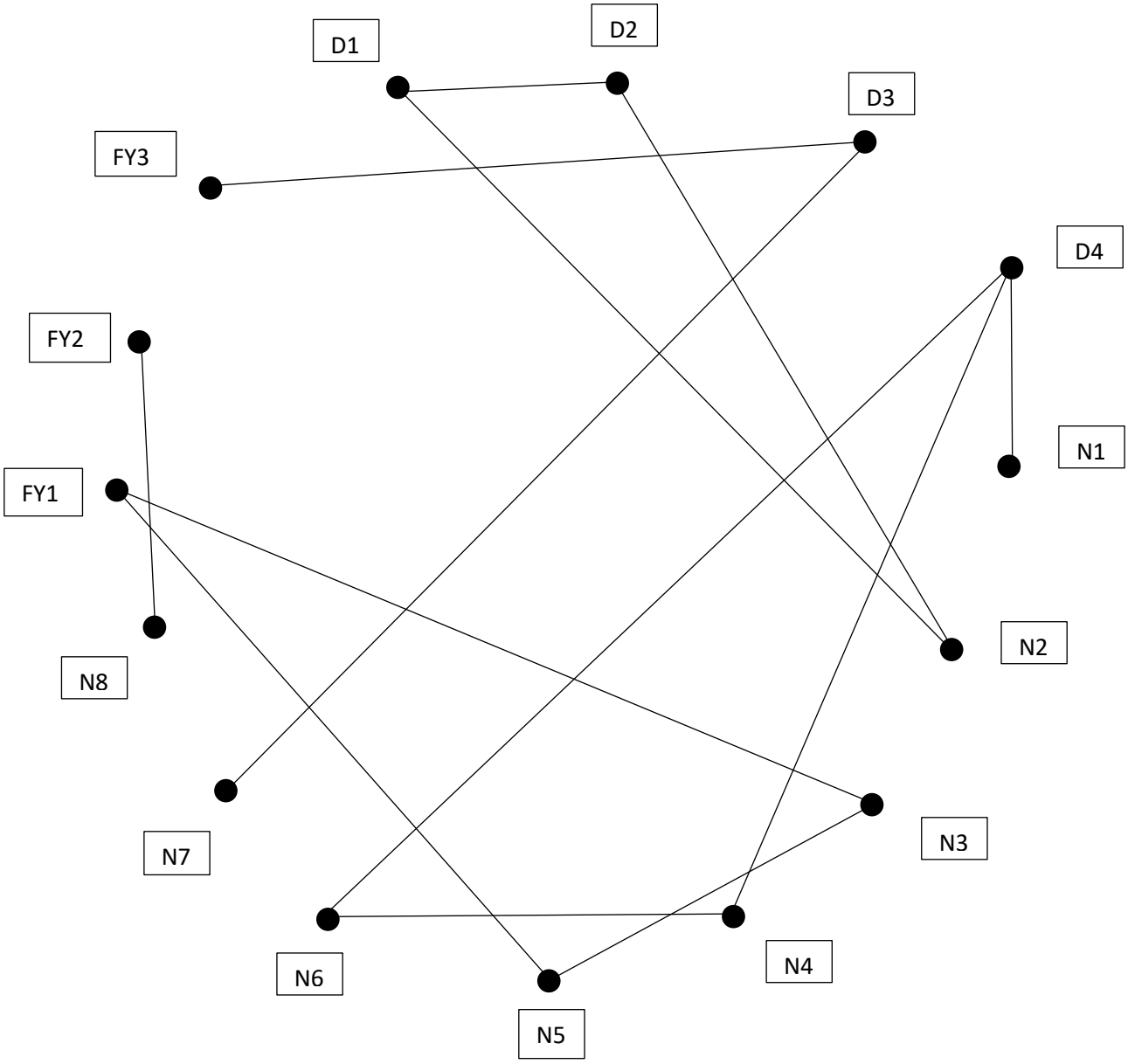
So, according to the above constraints we create groups.

| GROUP | NAME |
|---|---|
| A | D1, D2, N2 |
| B | N3, N5, FY1 |
| C | N8, FY2 |
| D | N1, D4 |
| E | N4, N6, D4 |
| F | N7, D3 |
| G | D3, FY3 |

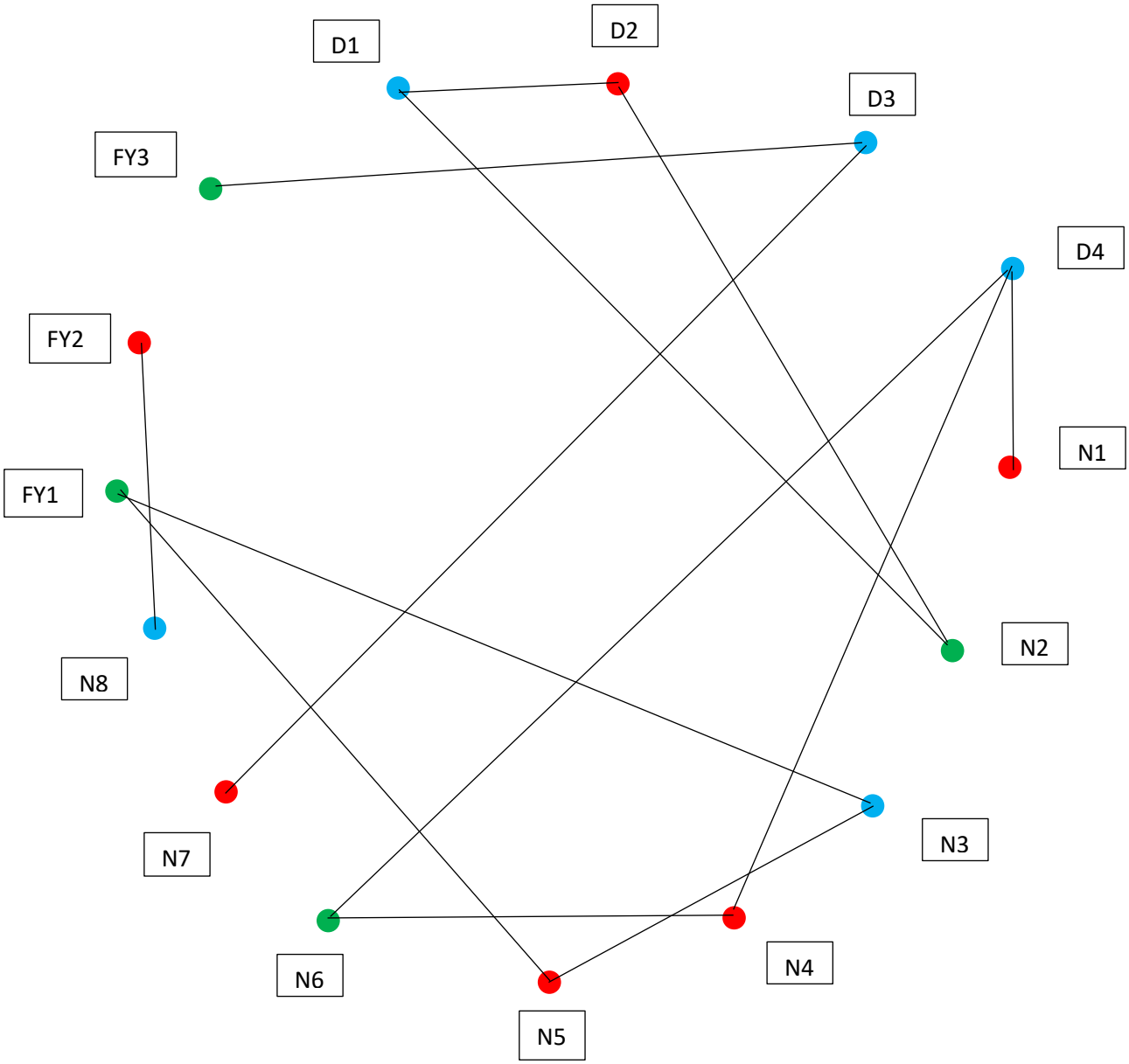
There are seven groups satisfying the constraints above. We need to create15 X 15 matrix. In that matrix names take as i and j. Then ij-th entry is put according to the above table. If any two nurses are in same group, then ij-th entry is put as '1' otherwise put it as '0'.

| | D1 | D2 | D3 | D4 | N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | FY1 | FY2 | FY3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| D4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| N1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| N4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| N5 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| N6 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| N8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| FY1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| FY2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| FY3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

Using above matrix, a graph is constructed by taking names as vertices. If two nurses are in same group according to the above table then the corresponding vertices are combined using edges.




As the next part, vertices in graph are coloured. If two vertices are adjacent, they are coloured using two different colours. Then again after we get certain number of coloured vertices we group based on same colour.




| GROUP | NAMES |
|---|---|
| G1 | D2, N1, N4, N5, N7, FY2 |
| G2 | D1, D3, D4, N3, N8 |
| G3 | N2, N6, FY1, FY3 |

At last we can group the doctors, nurses and final years day wise with the respectively shifts and their produced work will be more efficient as the in Day 1 the people in group 1 with work according to their shifts then group 2 at day 2 and so on.