HandsOn Assignment

$F_1, \dots, F_k$ Set of subjects having final exam.

$S_1, \dots, S_n$ Set of students giving them

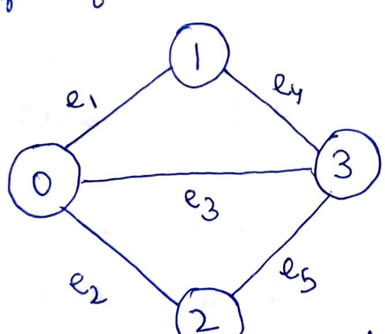
h is the number of slots they have to be scheduled.

Constraint: Student cannot give two exams in single slot

A proposed solution can be to take $F_1, \dots, F_k$ as nodes of graph and the edges connecting them be $S_1, \dots, S_n$. So the problem reduces to find the chromatic number of the graph which would be equal to h slots together with the constraint mentioned above.

Random Graph of n nodes can be generated

Take $n = 4$



The edges e_1, e_2, e_3, e_4, e_5 represent the students

Now each vertex can be represented by h colors

So Vertex Constraints: Lets take V_1 it would be

Assign color: $x_1 \vee x_2 \vee \dots \vee x_h$

Exactly one color: $(\neg x_1 \vee \neg x_2) \wedge (\neg x_1 \vee \neg x_3) \dots \wedge (\neg x_k \vee \neg x_h)$

Edge Constraints Take V_1

So the assigning & formulation is on next page.

Color 1 (Slot 1) : $(\neg x_1 \vee \neg x_{h+1})$

Color 2 (Slot 2) : $(\neg x_2 \vee \neg x_{h+2})$

Color h (Slot h) : $(\neg x_h \vee \neg x_{2h})$

Similarly for all other edges $e_2, e_3, \dots, e_5$ constraints can be calculated

With all the constraints (Vertex & Edge) of Graph given to SAT Solver will give the optimal no of slots (colors) to be used for scheduling the final exam subject allocation to respective students.

Note: The graph has no adjacent vertex (final exam subjects) with same color as the student (represented by graph edge) cannot give two exams (nodes) in a single slot (color).

So for the SAT solver, the constraints can be ordered as Vertex and Edge constraints in .cnf file accordingly specifying the number of clauses (x_i variables) and constraints in the header of it.

The not in cnf file will be treated as - so our constraints can be updated with the respective clauses accordingly.

The following problem is an allocation problem which can be reduced to a NP complete problem which can be passed to the SAT solver with appropriate clauses & constraints which gives the solution for the same.