Formal Methods - lab exam
Facsimile di prova

Exercise 1

You are the owner of one of the most prestigious concert halls in New York. In the last days you received a lot of requests from different bands to book the hall on the 4th of July and you are unsure about being able to accept them all. Some organization rules are the following:

- Bands can book the hall from 18.00 to 24.00.
- Bands can reserve one or more slots of 1 hours, the slots being 18.00-19.00, 19.00-20.00, 20.00-21.00 and so on.

This is the list of all the requests received until now:

- The Beagles: from 19.00 to 21.00 or from 22.00 to 24.00
- AC/DC++: 3 consecutive hours, no matter when.
- Rolling Stonks: from 18.00 to 19.00 or from 23.00 to 24.00
- Kanji West: 1 hour among all the slots, excluding the first slot and the last one.

Use OptiMathSAT to encode the problem as a SAT problem (make sure not to use non-Boolean data types) and see if you can satisfy the requests of all the customers.

- If you can satisfy everyone, write a comment reporting the valid schedule.
- Otherwise slightly modify the problem so that you can return a schedule where the maximum amount of bands can perform live. Take into account that AC/DC++ must perform no matter what, given their popularity.

Exercise 2

Four students took a test where every question had two possible answers, A or B. Each question was worth 10 points, for a total of 100 points. There is no penalty for giving a wrong answer. The students' test results were posted as seen below:

As you can see, the teacher forgot to tally John's score. John was heading to the teacher's office when Mary called him back, saying they could figure out his score using the results from the other tests. Can you figure out John's score?

Use MathSAT to encode the problem as a SMT problem and find the solution. Once obtained, report it on as a comment at the end of the file. Is the answer key reported as a solution unique (meaning that there is no other possible answer assignment reaching the same score)? Add some constraints to test its uniqueness and write in a comment the result:

- If the solution is unique, write how you assumed it.
- If the solution is not unique, write how you assumed it and report a second solution in the comments.