PGT Exam Performance Feedback 2017/2018 Semester 2

COMP60332 Automated Reasoning and Verification

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Comments

Question 1

a)i), ii), iii)
Most students answered correctly.

a)iv)
The statement is false as was discussed in lectures but a number of students attempted to prove it.

b) Some students failed to state main differences between structural and syntactic CNF transformation.

c) i) Most students answered this correctly.
ii) Several students answered correctly but many did not know what a sound inference rule is.
iii) Some students answered correctly but many could not show that resolution and factoring are sound rules.

d) Many students struggled to formalise the problem in propositional logic, some attempts are mixture of first-order and propositional logc.

Question 2

a. i), iii) Fine
a. ii) Mostly fine

a. iv) Several students represented 2X=Y as

(2b^x_0<->b^y_0) & ..& (2b^x_{n-1}<->b^y_{n-1}):

this is not a propositional formula; even if 2b^x_0 is treated as the Boolean sum this still would not represent the original equation.

b) i) Fine,
b) ii) Mostly fine.
b) iii) Those who attempted, answered correctly.

c) Mostly fine, some did not draw paths correctly or used the whole graph. Some had problems with the until operator.

d) Those who attempted answered reasonably, unfortunately not many students attempted.

Question 3

This question had an average mark of 62%. Of the 9 students who attempted the question, 3 had marks below 50% and 4 students had first class marks. The best mark was 20 which was achieved by one student.

a) i)Posed no problems. Everybosy who answered the question got full marks.

ii)Most students handled this question well. Some students made the mistake of trasnforming the formula into CNF (= conjunctive normal form). The question however required transforming the formula into negation normal form, we did not discuss this kind of normal form, but the question specified how to do the transformation.

iii) I gave full marks for the correct answer either obtained from ii), or i) using intuition.

b)Almost everyone got either 3 or 4 out of 4 marks, one student got 2 marks and no-one got less. The very few mistakes made included: not saying what the answer is to the given question and small mistakes in applying the rules of the unification algorithm.

c)The answers were mixed. Most students recognised that in each case the formula needed to be negated, transformed into a set of clauses and resolution applied. A surprising number of students made mistakes in the conversion to clausal form.

d)This subquestion proved to be hardest, which was expected, one student got full marks.

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In each case, 1 mark was awarded for a correct True/False answer and a correct explanation or counter-example. This means correct guesses with wrong or absent explanations would have received 1 mark (and a few cases did).

The subquestions had to be read very carefully. In the case of ii) the question was essentially whether the set has infinitely many models. I.e. it was about the number of possible models, not the size of possible models.

Question 4

The average for this question was 64%. Of the 12 students who attempted the question 1 had marks below 50% and 5 students had first class marks. The best mark was 20 which one student achieved (well done!).

a)This was the bookwork question, where 2 of 4 concepts needed to be described. Almost everyone got between 2-4 marks. Here I was looking for two key facts (which may vary) for the full 2 marks. One key fact or a minor mistake received one mark.

b)This assessed knowledge of the model construction method.

i) Almost everyone who answered the question had a perfect answer.

ii) The most common mistake was not recognising that when a clause is true in the partial interpretation I_C constructed so far; note in this test one needs to check the truth of all literals in a clause, not just the maximal ones.

iii) Everybody drew the correct conclusion from their construction in ii).

c) i) Everyone could identify the maximal lietarls and got this question right!

ii) But doing the correct inferences on the maximal literals proved to be harder. Common mistakes:

- Performing a resolution step, when the positive resolved upon literal is only maximal and not strictly maximal, is not necessary. In this case ordered positive factoring is applicable. In particular, in

P(x1,x2) \/ P(x1,x1) \/ -R \/ S(x1)

the first two literals are maximal. Ordered resolution is not applicable, but ordered positive factoring is.

- Factoring on non-maximal literals.

In both these cases the inferences are not wrong, but they are unneeded and lead to a different derivation that is shorter and therefore could not collect all the marks. As a result fewer marks could be obatiend for iii).

A surprising numer of students used ground resolution, which is not what the question asked (and will very often require infinitely many inference steps to find a ground saturation for a satisfiable set).

iii) To get full marks a correct derivation needed to be given in ii). Marks were awarded for correct examples from the derivation in ii), but in cases where short-cuts were used as a result of unordered inferences not enough redundant clauses were produced to get full marks.