MATH43032/63032 Exam Feedback, 2012

A1, A2 Generally well done.

A3. There was a very common error here in part (i). Students started of the argument OK by saying:

> "Let $\langle W, E, V\rangle$ be a B-frame, so E is symmetric, and let $i \in W$, $i \models \theta$. Suppose that $\langle i, j\rangle \in E$, so $\langle j, i\rangle \in E$ by symmetry and $j \models \Diamond\theta$."

At this point they said

"Therefore $i \models \Diamond\Diamond\theta$."

Nothing actually wrong with this (except that it's going off the path). But then they went on to say,

"So $j \models \Box\Diamond\Diamond\theta$ and hence $i \models \Box\Box\Diamond\Diamond\theta$".

The first conclusion here was wrong because i is not necessarily the only vertex in W to which j is connected, there could be some $k \in W$, $k \neq i$, such that $\langle j, k\rangle \in E$ and at this point it has not been shown, nor ever was, that we must also have $k \models \Diamond\Diamond\theta$. In fact for such a k we must also have $\langle k, j\rangle \in E$, since E is symmetric, so $k \models \Diamond\Diamond\theta$ because $j \models \Diamond\theta$.

Part (ii) was well done.

A4. Despite all the indications that at some point you'd be asked to define what a proof was many students missed out key features of the definition, for example (in the notation of the models answers) that the Γ_i must be finite and the $j_1, j_2, \ldots, j_s$ must be less than i.

The rest of this question was well done.

A5. Parts (i) and (ii) were quite well done, though some students didn't explain too well what they were actually doing.

Quite a few of the solutions to part (iii) showed a lack of understanding. You were supposed to argue in terms of $\vdash^{Ł}$, as allowed by Proposition 8 (see model answers). Instead however wrote down a 'proof' whose first line was (something like)

$$1 \qquad |\theta \to \phi \qquad \text{REF}$$

The point is that the given $\vdash^{Ł} \theta \to \phi$ only tells you that $|\theta \to \phi$ is the last line of some proof in Ł, not that it's an instance of REF.

A6. Generally well done. I must profusely apologize for an error in the last part of the question,

> What can be said about the structure $\langle [0, 1], F_\wedge, <\rangle$ if in addition to C1-C4 $F_\wedge$ also satisfies that for all $x \in [0, 1]$, $0 < F_\wedge(x, x) < x$?

should have read

> What can be said about the structure $\langle [0,1], F_\wedge, < \rangle$ if in addition to C1-C4 $F_\wedge$ also satisfies that for all $x \in (0,1)$, $0 < F_\wedge(x,x) < x$?

i.e. $[0,1]$ should have been $(0,1)$. Since the stated condition was impossible *any* answer would be correct here, and that's how I treated it, *any* answer got the marks. Again my apologies for this error, and you wouldn't believe how many times I (and 3 others) checked this paper. Perhaps we should get the students to check the papers instead of the lecturers!

B7. Not very well done, despite there being many opportunities to practice similar questions. Commonly students adopted a poor strategy for solving the problem. For example a common mistake, at least it made the problem more complicated to solve, was to start off by focusing on the premiss and considering the least i (assuming there was one) such that $s_i \cap S_{\theta \wedge \neg \phi} \neq \emptyset$ rather than focusing on the conclusion and looking at the least i (again assuming there was one) such that $s_i \cap S_\theta \neq \emptyset$. This was a poor approach since at some point you know that you *must* consider this latter whilst it would be better not to engage with the former until there was an immediate good reason to do so.

As with the take home test some students lost marks in the last part because they left θ, ϕ, ψ as general sentences but then specified, for example, $s_1 = \{\theta \wedge \phi \wedge \psi\}$ as if θ, ϕ, ψ were distinct propositional variables and $\theta \wedge \phi \wedge \psi$ was an atom.

B8. Checking the validity of the new axiom in these serial frames was well done but very few students knew what to do for the other direction. The last part was generally handled OK.

B9. The book work in this question, i.e. stating McNaughton's Theorem, was mostly answered well but the widespread failure to even get near to using it in the next two parts showed that few of the students actually had a picture of what the theorem was saying about the function $F_\theta(x)$.

Overall students scored highly on part A, which had quite a lot of book work and easy questions but fell down on the part B questions, usually only picking a few marks on the small amount of book work they contained. This was in sharp contrast to the two course works which were similar in style to questions B7 and B8 and averaged out across the class at 7 or 8 out of 10. At the time of typing this I don't expect to apply any scaling to these papers, so the average for MATH43032 will be 68.3 and for MATH63032 will be 69.1.