There are 10 questions worth a total of 29. Not all questions may be graded.

1. 1 mark  Q2.2 f — 1 mark
2. 3 marks  Q2.6 — 1 each.
3. 4 marks  Q2.14 — 1 each
4. 3 marks  Q2.18 — 1 each
5. 4 marks  Q2.20(a,b)
6. 2 marks  Write out the truth tables for $P \Rightarrow Q$ and $Q \Rightarrow P$. For what truth values of $P$ and $Q$ do the truth values of $P \Rightarrow Q$ and $Q \Rightarrow P$ differ?
7. 3 marks  Consider the statement: I will play hockey only if you pay me 5 million next year and buy me a house in the British Properties.
   (i) Write out the above in the form, if $P$, then $Q$, for appropriate $P$ and $Q$.
   (ii) Write out the converse and contrapositive, first in logical symbols, and then in clear English (state it as simply as possible).
8. 4 marks  2.38 First, use the fact that logical equivalence means the biconditional is true rather than writing out the truth tables. For establishing the biconditional recall that $A \Rightarrow B$ is T providing that you can establish that $B$ is T when $A$ is T. Now verify the above by checking that the truth tables are the same.
9. 2 marks  2.40
10. 3 marks  Consider the statement: The fish are biting and there are no bugs, or the fish are not biting and there are bugs, or it is winter.
     Write out the negation of the above in English. You should simplify your answer as much as possible, being sure of course that it is logically equivalent to the negation. Justify your answer.