CS 381 Test 1

February 19, 2003

1. Convert the following statements to if, then form in English:
   (a) Few people can solve difficult problems.
   (b) Healthy diet is necessary for healthy body.
   (c) Further technological advances are possible only if there are free discussions.
   (d) You can not cash a check which is void. [20]

2. Negate the following statements in English. Give a form other than simply putting "not" or "it is not the case that" in front:
   (a) If today is Tuesday then I have a test in Computer Science or in Biology.
   (b) Everyone visited some room in this building.
   (c) Someone likes it but does not eat it.
   (d) Tomorrow it is going to rain or snow. [20]

3. Find the converse and contrapositive of the following statement in English:
   (a) If it is sunny, people are happy.
   (b) Some people like mathematics only if it is fun for them. [20]

4. Find the dual of \( \text{True} \land (P \lor \neg Q) \land \neg (Q \lor \text{False}) \). [5]

5 (a) Express the argument given below using the symbold suggested for each proposition. [8]
(b) Check whether or not the reasoning is correct using inference rules on the propositions in symbolic form. [12]

**Argument:**
If I like mathematics\((L)\), then either I study it hard\((H)\) or I enjoy studying it\((E)\). If I enjoy studying mathematics, then I pass the mathematics course\((P)\). If I study mathematics hard, then I don’t like mathematics and if I enjoy studying mathematics then I study mathematics hard. But I like mathematics. Therefore I don’t pass the mathematics course.
6. Fill in the blanks:

(a) \[ \neg [ \ P \land Q \ ] \rightarrow P \ ] \iff [ P \land [ \ ] \iff [ \ P \land [ \ ] \land Q \ ] \iff [ \ ] \land Q ]

(b) \[ P \land \neg [ \ \neg P \land Q \ ] \iff [ P \land [ \ ] \lor \neg Q ] \]

(c) \[ P \lor [ \ Q \land R \ ] \iff [ \ P \lor \lor \ ] \lor [ P \lor R \ ] \]

[15]