1[25%].

(a) Modeling the following statements using propositional logic. You should first introduce the basic propositions and then define logical formulas for the statements.

A1: Programming gives me headache unless the project is exciting.
A2: Programming an exciting project makes me happy.
A3: If I am happy, then I do not have a headache.
A4: I am programming now and I am happy.

α : the project is exciting.

(b) Use the resolution method to show that statement α is a logical consequence of statements A1, A2, A3 and A4.

You should first show the clauses obtained from your formulas for A1, A2, A3, and A4 as well as ¬α. And then you should show the resolution derivation of the empty clause from these clauses.

2[25%].

Question 8.10 of the text book.

3[15%]

Question 8.18 of the text book.

4[15%].

Question 8.22 of the text book.

5[20%].

Question 8.23 of the text book.

6[Bonus: 20%]

Programming assignment - this part can be submitted on Monday October 21, 2013:

Write a program that generates S, a random set of clauses and then uses the WALKSAT function in the text book (page 263) to test if the set S is satisfiable. The inputs to the program are: (1) n, the number of distinct propositional symbols in S; (2) m: the number of clauses in S; (3) k: maximum number of literals in a clause in S. For simplicity, you can assume that all clauses in S have size k. The program outputs two items: (1) The clauses in S; (2) A model (truth assignment to the propositions) for S, or "failure" - after "max_flips" many trials to do "random walk" in the WALKSAT function. You can assume max_flips = 100 and P = 0.5 in your calls to the WALKSAT function.

Print out the results of two runs of your program: with n = 10, m = 15 and k=3, and with n=6, m=20, and k=3.