CS533: Homework 8

Question 1: Exercise 4.6 Part b, c, e, f
This is problem 4.6 in the 3rd edition, problem 4.5 in the 2nd edition.

Question 2: Exercise 4.8
This is problem 4.8 in the 3rd edition, problem 4.7 in the 2nd edition.
Give pseudo code that will output all triples. You are basically giving an enumerator TM.

Question 3: Exercise 4.13
This is problem 4.13 in the 3rd edition, problem 4.12 in the 2nd edition.
Prove that your construction is correct.

Question 4: Exercise 4.21
This is problem 4.21 in the 3rd edition, problem 4.19 in the 2nd edition.

Question 5: Exercise 4.11
This is problem 4.11 in the 3rd edition, problem 4.10 in the 2nd edition.

Chapter 5

When you prove a language is undecidable using a proof by contradiction, make sure you clearly say what you are assuming, clearly give your construction, and say why there is a contradiction (explain what the construction is doing), and what assumption is thus false.
You can make use of any of the languages that are proved undecidable in Chapters 4 and 5, but cite which theorem it is from.

Question 6: Exercise 5.1
Hint: find a language from Chapter 5 that is undecidable that is about CFG and make a reduction from it to $EQ_{CFG}$.

Question 7: Exercise 5.2
You need to give a construction of a TM. First, explain what this TM needs to check. Second, give a construction of your TM. Give a high level description, like the descriptions in this chapter. Clearly say what the input is. Argue why your TM is correct. Note that you do not need any of the tools in this chapter to solve this question.
Question 8: Exercise 5.3

Question 9: Exercise 5.9

Construct a reduction from $A_{TM}$. Make sure you argue why your TM decides $A_{TM}$. Your proof will have a similar structure as the proof of Theorem 5.3, in which you give the construction of a TM, which itself constructs a TM.