Discrete Mathematics Homework1

Section 1-1

6 . Suppose that Smartphone A has 256 MB RAM and 32 GB ROM, and the resolution of its camera is 8 MP ; Smartphone B has 288 MB RAM and 64 GB ROM, and the resolution of its camera is 4 MP; and Smartphone C has 128 MB RAM and 32 GB ROM, and the resolution of its camera is 5 MP. Determine the truth value of each of these propositions.

- (a) False (b) True (c) False (d) False (e) False

10 . Let p and q be the propositions "The election is decided" and "The votes have been counted," respectively. Express each of these compound propositions as an English sentence.

- (a) $\neg p$: ***The election is not dicided.***
- (b) $p \vee q$: ***The election is decided or the votes have been counted.***
- (c) $\neg p \wedge q$: ***The election is not dicided and the votes have been couted.***
- (d) $q \rightarrow p$: ***If the votes have been counted, the election is decided.***
- (e) $\neg q \rightarrow \neg p$: ***If the votes have not been counted, the election is not be decided.***
- (f) $\neg p \rightarrow \neg q$: ***If the election is not decided, then the votes have not been counted.***
- (g) $p \leftrightarrow q$: ***The election will be decided if and only if the votes have been counted.***
- (h) $\neg q \vee (\neg p \wedge q)$: ***The election is not decided and the votes have been counted, or the votes haven't been counted.***

28 . State the converse, contrapositive, and inverse of each of these conditional statements.

- (a) If it snows tonight, then I will stay at home.
  - converse : ***If I stay at home, it will snow tonight.***
  - contrapositive : ***If I don't stay at home, it won't snow tonight.***
  - inverse : ***I won't stay at home if it doesn't snow tonight.***
- (b) I go to the beach whenever it is a sunny summer day.
  - converse : ***It is a sunny summer day whenever I go to the beach.***
  - contrapositive : ***It is not a sunny summer day whenever I don't go to the beach.***

- inverse : ***I don't go to the beach whenever it isn't a sunny summer day.***

- (c) When I stay up late, it is necessary that I sleep until noon.
  - converse : ***When I sleep until noon, it is necessary that I stay up late.***
  - contrapositive : ***When I don't sleep until noon, it is necessary that I don't stay up late.***
  - inverse : ***When I don't stay up late, it is necessary that I don't sleep until noon.***

Section 1-2

10 . Are these system specifications consistent? "Whenever the system software is being upgraded, users cannot access the file system. If users can access the file system,then they can save new files. If users cannot save new files, then the system software is not being upgraded." - ***Let*** p, q, r ***represent "The system software is being upgraded.", "Users can access the file system."and "Users can save new files." respectively, then the sentences can be translated to :***

$p \rightarrow \neg q$: "Whenever the system software is being upgraded, users cannot access the file system."

$q \rightarrow r$: "If users can access the file system,then they can save new files."

$\neg r \rightarrow \neg p$: "If users cannot save new files, then the system software is not being upgraded."

1. ***Assume that*** $\neg r$ ***is true, then*** $\neg p$ ***is also true.***
2. ***Since*** r ***is false,*** q ***must be false.***

- ***When*** p, q, r ***are false, all three propositions are true, so they are consistent.***

20 . A says "The two of us are both knights" and B says "A is a knave." - ***If A is a knight, then B will also be a knight. In that case, both of them are telling the truth ,which means A is a knight and a knave. That is a contradiction. So A is a knave and B is a knight, bcause B is telling the truth.***

Section 1-3