LOGIC COMP SOLUTIONS

Solution 1: (A) If P is a necessary condition for Q, then $\neg P \rightarrow \neg Q$. This is equivalent to $Q \rightarrow P$, which means that Q is a sufficient condition for P.

Solution 2: (A) By the definition of *"only if"*

Solution 3: (C) By a simple induction argument

Solution 4: (D) Straight-forward from the definitions.

Solution 5: (B)

Solution 6: (D) We can't conclude anything about the validity of $\mathcal{F}$ from the given assumption that $\mathcal{F}$ is satisfiable.

Solution 7: (B)

Solution 8: (D)

Solution 9: (D)

Solution 10: (D)

Solution 11: (B)

Solution 12: (A)

Solution 13: (A) follows from the compactness theorem.

Solution 14: (B) In general, validity need not be recursive, but since we have a sound and complete axiom system, we can enumerate all proofs. The proof of any valid sentence will be eventually appear, and so we have an effective enumeration for the valid sentences.

Solution 15: (C) The validity problem for propositional logic is decidable. That is, for any sentence we can determine if it is valid or not. For predicate logic, the validity problem is only semi-decidable.

Solution 16: (B) II is true because Gōdel's Incompleteness Theorem holds for the theory of natural numbers with addition and multiplication. III is true because Gōdel's Incompleteness Theorem does NOT hold for theory of natural numbers with only addition.

Solution 17: (C)