Homework – 01

Topic: Compound Propositions using $\neg, \wedge, \vee, \oplus$

1. Develop truth tables for the following compound propositions.
   a) $(p \wedge q) \vee (\neg p \vee (p \wedge \neg q)) \vee r$
   b) $(p \wedge \neg q) \wedge (\neg p \vee q) \wedge r$
   c) $((\neg p \wedge q) \wedge (q \vee r)) \wedge \neg q \wedge r$

2. Let h: "Amir is handsome", c: "Amir is clever", p: "Amir is optimistic". Rewrite the following in symbolic forms using $\neg, \wedge, \vee$ and $\oplus$. You should not simplify the compound propositions.

   a) Amir is handsome and clever but not optimistic.
   b) Amir is either clever or handsome or both.
   c) Amir is either clever or handsome but not both.
   d) Amir is neither handsome, nor clever nor optimistic.
   e) Amir is not both handsome and clever, but he is optimistic.
   f) Amir is optimistic but not clever nor handsome.

3. Let p, q, and r be the propositions:

   p : You get an A on the final exam.
   q : You do every exercise in this book.
   r : You get an A in this class.

   Express the following in symbolic form:
   a) You get an A in this class, but you do not do every exercise in this book.
   b) You get an A on the final, you do every exercise in this book, and you get an A in this class.
   c) You get an A on the final, but you don't do every exercise in this book; nevertheless, you get an A in this class.

4. Consider the simple propositions: r: Roses are red, b: Violets are blue and s: Sugar is sweet. Translate the following statements into intelligible English.
   a) $b \vee \neg s$
   b) $r \vee (b \wedge \neg s)$
   c) $(r \vee b) \wedge \neg s$

5. Consider the proposition labels: f: food is good, s: service is excellent, p; price is high. Translate each of the following compound statements into symbolic notation.
   a) The food is good but the service is not excellent.
   b) The food is good and the service is excellent, but the price is high.
   c) Neither the food is good nor is the service excellent.