CSE230: Discrete Mathematics

Assignment 4

Deadline: 28th August, 2022

1. Let p, q, and r be the propositions
   p :You have the flu.
   q :You miss the final examination.
   r :You pass the course.
   Express each of these propositions as an English sentence.
   a. $p \rightarrow q$
   b. $\neg q \leftrightarrow r$
   c. $q \rightarrow \neg r$
   d. $p \vee q \vee r$
   e. $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$
   f. $(p \wedge q) \vee (\neg q \wedge r)$

2. Construct a truth table for:
   a. $(\neg p \leftrightarrow \neg q) \leftrightarrow (q \leftrightarrow r)$
   b. $(p \oplus q) \wedge (p \oplus \neg q)$

3. Show if the following is a tautology, contradiction or contingency:
   a. $[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$
   b. $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$

4. Translate in two ways each of these statements into logical expressions using predicates, quantifiers, and logical connectives. First, let the domain consist of the students in your class and second, let it consist of all people.
   a. Everyone in your class has a cellular phone.
   b. Somebody in your class has seen a foreign movie.
   c. There is a person in your class who cannot swim.
   d. All students in your class can solve quadratic equations.
   e. Some students in your class do not want to be rich.

5. Customers arrive at a local store at a rate of 6 per hour.
   a. What is the probability that, in any 2.5 hour period, the number of customers arriving is:
      (i) exactly 7
      (ii) at least 10
   b. A customer arrives at the local store at 3:35pm. What is the probability that the next customer arrives before 3:50pm?

6. Suppose that the probability of a defect in a foot of magnetic tape is 0.002. Use the Poisson approximation to compute the probability that a 1,500-foot roll will have no defects.

7. 5 cards are drawn from a well shuffled deck of cards with replacement. What is the probability that you pick 2 spades, 1 diamond, 1 club and a heart?

8. In a recent poll, 23% of the respondents supported candidates A, 19% supported candidate B, 13% supported candidates C, and 45% were undecided. If 7 people are chosen at random, what is the probability that 2 people support candidate A, 2 support candidate B, 1 support candidate C and 2 are undecided?