1. Establish the validity of the following arguments

   (a) Some monkeys eat bananas. All monkeys are primates. Therefore some primates eat bananas.

   (b) All computer scientists are clever or wealthy. No computer scientist is wealthy. Therefore all computer scientists are clever or witty.

   (c) Everyone shouts or cries. Not everyone cries. So some people shout and don't cry.

   (d) Babies are illogical. Nobody is despised who can manage a crocodile. Illogical persons are despised. Therefore Babies can't manage crocodiles.

   (e) One student in this class know how to write a programs in JAVA. Everyone who knows how to write programs in JAVA can get a high-paying job. Therefore some in this class can get a high-pay job.

   (f) All integers are rational numbers. Some integers are power of 2. Therefore some rational numbers are power of 2.

2. Define the following:
   F(x): x is greater than five
   E(x): x is an even number
   N(x): x is negative
   Consider the following universe of discourse:

   • integers

   • real numbers

   • negative numbers

   Determine the truth value of each of the following propositions in each universe of discourse.

   (a) $\exists$ x F(x)

   (b) $\forall$ x N(x)

   (c) $\forall$ x(F(x)$\wedge$E(x))

3. Express the negations of the following statements using quantifiers and in English.

(a) If the teacher is absent, then some students do not keep quiet

(b) All the students are keep quiet and the teacher is present

(c) Some of the students do not keep quiet or the teacher is absent.

4. Prove the following by using direct method

    (a) P∧Q,(P↔Q)→(R∨S)⇒(R∨S)

    (b) (P∧Q)→R, ¬R∨S, ¬S⇒(¬P∨¬Q)

    (c) P→Q,(¬Q∨R)∧¬R, ¬(¬P∧S)⇒¬S

    (d) (P→Q)→R, P∧S, Q∧T⇒R

5. Prove the following by using indirect method

    (a) P→Q,Q→R,¬(P∧R),(P∨R)⇒R.

    (b) P→Q, ¬Q,P∨R⇒R

    (c) S→¬Q, S∨R,¬R,¬R↔Q⇒¬P

6. Prove the following by using the CP rule

    (a) (P∨Q)→R⇒(P∧Q)→R

    (b) ¬P∨Q, ¬Q∨R, R→S⇒(P→S)

    (c) P→(Q→S),¬R∨P,Q⇒R→S

7. Prove that each of the following sets of premises is inconsistent.

    (a) P→Q, P→R,Q→¬R, P

    (b) P→Q,(Q∨R)→S,S→¬P, P∧¬R

    (c) P→(Q→R),Q→(R→S),P∧Q∧¬S