



- a) The election is not decided.
- b) The election is decided or the votes have been counted.
- c) The election is not decided and the votes have been counted.
- d) If the votes have been counted, then the election is decided.
- e) If the votes have not been counted, then the election is not decided.
- f) If the election is not decided, then the votes have not been counted.
- g) The election is decided if and only if the votes have been counted.
- h) It is not true that the election is decided or the votes have been counted, and it is true that the election is decided and the votes have been counted.



(ii)

- a) • converse: if I ski tomorrow, then it snows today.
- contrapositive: if I do not ski tomorrow, then it does not snow today.
- inverse: if it does not snow today, then I will not ski tomorrow.

- b) • converse: if I come to class, then there is going to be a quiz.
- contrapositive: if there is not going to be a quiz, then I do not come to class.
- inverse: if I do not come to class, then there is not going to be a quiz.

- c) • converse: if a positive integer has divisor other than 1 and itself, then it is a prime.
- contrapositive: if ~~the~~ a positive integer is not a prime, then it has divisors other than 1 and itself.
- inverse: if a positive integer has divisors other than 1 and itself, then it is not a prime.



* (iii) (a) This is an inclusive or, meaning that experience with either C++ or Java or Both is required. An exclusive or would imply that only one of the two languages is acceptable, which is unlikely in this context.

(b) This is an exclusive or, meaning that either a passport or a voter registration card or both are sufficient to enter the country. An exclusive or would imply that only one of the two documents is valid, which is unreasonable in this context.

(c) This is an exclusive or, meaning that lunch includes either soup or salad but not both. An inclusive or would imply that both soup and salad are included in lunch, which is uncommon in this context.

(d) This is an exclusive or, meaning that one must either publish or perish but not both. An inclusive or would imply that both publishing and perishing are possible outcomes, which is contradictory in this context.

(12) (i) (a) If you study hard, then you will not fail the test.

(b) Either you do not miss the final examination, or you miss the final examination, or you pass the course.

(c) Either if you cheat on the exam, then you will not pass the course, or if you miss the final examination, then you will not pass the course.

(d) You miss the final either you are sick and you miss the final examination, or you do not miss the final examination and you pass the course.



(Q₂) (i) $\neg \neg P$, (B) $(\neg P) \rightarrow Q$, (C) $\neg P \rightarrow \neg Q$, (D) $(\neg P) \rightarrow Q$

(ii)

S	T	U	$S \rightarrow \neg T$	$T \rightarrow U$	$\neg U \rightarrow S$
T	T	T	F	T	T
T	T	F	F	F	T
T	F	T	T	T	F
T	F	F	T	T	T
F	T	T	T	T	F
F	T	F	T	F	F
F	F	T	T	T	F
F	F	F	T	T	F

(iii)

V	W	X	Y	$\neg V \rightarrow \neg W$	$\neg V \leftrightarrow X$	$\neg V \rightarrow Y$	$\neg V \leftrightarrow Y$
T	T	T	T	T	F	T	F
T	T	F	T	T	F	T	F
T	F	T	T	T	F	T	F

(iv)

(v)

(vi)

(vii)

(viii)

(ix)

(x)

(xi)

(xii)

