Digital Assignment

MAT1014: Discrete Mathematics and Graph Theory

Max. Marks: 10 Slot: A1 & A2 (31/01/2020)

Reg. No: Name:

---

1. Obtain the PDNF (Canonical sum-of-products form) of $P \vee (\sim P \wedge \sim Q \wedge R)$.

2. Obtain the PCNF (Canonical Product-of-sums form) of $(\sim P \vee \sim Q) \rightarrow (\sim P \wedge R)$ using truth table.

3. Test the validity of the following argument by method of contradiction.

$$((\sim P \leftrightarrow Q) \wedge (Q \rightarrow R) \wedge \sim R) \rightarrow P.$$

4. Establish the validity of the following arguments.

If Dominic goes to the racetrack, then Helen will be mad.

If Ralph plays cards all night, then Carmela will be mad.

If either Helen or Carmela gets mad, then Veronica (their attorney) will be notified.

Veronica has not heard from either of these two clients.

Consequently, Dominic didn't make it to the racetrack and Ralph didn't play cards all night.

5. Establish the validity of the following arguments. (Predicate Calculus)

No junior or senior is enrolled in a physical education class.

Mary is enrolled in a physical education class.

Thus Mary is not a senior.

6. Check the validity of the following argument.

All lions are fierce.

Some lions do not drink coffee.

So some fierce creatures do not drink coffee.

7. Show that $(x)(\sim R(x) \rightarrow P(x))$ logically follows from $(x)(P(x) \vee Q(x))$ and

$(x)((\sim P(x) \wedge Q(x)) \rightarrow R(x))$.

- For open statements p(x), q(x), the universally quantified statement $\forall x[p(x) \rightarrow q(x)]$, we define
  - Contrapositive: $\forall x[\neg q(x) \rightarrow \neg p(x)]$
  - Converse: $\forall x[q(x) \rightarrow p(x)]$
  - Inverse: $\forall x[\neg p(x) \rightarrow \neg q(x)]$

8. Let $P(x): |x| > 3$ and $Q(x): x > 3$.

Is the statement $(x)(P(x) \rightarrow Q(x))$ true?. Also find the converse, inverse and contrapositive of $(x)(P(x) \rightarrow Q(x))$ and verify the trueness of those statements.

9. Let $P(x, y), Q(x, y)$ and $R(x, y)$ represents three statments. What is the negation of the following statement? $(x) \ni (y)[(P(x, y) \wedge Q(x, y)) \rightarrow R(x, y)]$.

10. Using Rule CP, derive $P \rightarrow \sim S$ from $P \rightarrow (Q \vee R)$, $Q \rightarrow \sim P$, $S \rightarrow \sim R$.

11. Check the validity of the following argument.

If the band could not play rock music or the refreshments were not delivered on time, then the New Year's party would have been cancelled and Alicia would have been angry. If the party were cancelled, the refunds would have had to be made. No refunds were made. Therefore, the band could play rock music.