SRM Institute of Science and Technology

Department of Mathematics

18MAB302T- Discrete Mathematics

UNIT–3 / Tutorials – 1

1. List the converse, inverse, and contrapositive of the statement

   (i) "If p is prime, then $\sqrt{p}$ is irrational."
   (ii) "If it is raining, then there are clouds in the sky."

2. Show that $(p \vee (p \wedge q) \leftrightarrow p) \Rightarrow (p \vee (p \wedge \neg q)) \leftrightarrow p$, using truth table.

3. Negate the following statements using symbolic form.

i) I don't eat anything that has a face. ii) A prime number is an integer.

4. Symbolize "It is sufficient for Shiva to win this frame, to win the bowling trophy"

5. Show that, using truth table, $p \rightarrow (q \vee r) \equiv (p \wedge \neg q) \rightarrow r$

6. Prove that (i) $(p \rightarrow T) \wedge (F \rightarrow q) \equiv T$
   (ii) $(F \vee p) \rightarrow (q \wedge F) \equiv F$, using truth tables

7. Prove that $p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$, using laws.

8. Without constructing truth table prove that $(p \wedge q) \rightarrow (p \vee q) \equiv T$

9. Without constructing truth table, prove that $(p \rightarrow q) \wedge (\neg r \vee s) \wedge (p \vee r) \Rightarrow (\neg q \rightarrow s)$.

10. Check the validity of the following statement.

"If it is Saturday today, then we play soccer or basketball". "If the soccer field is occupied, we don't play soccer"."It is Saturday today, and the soccer field is occupied". Therefore "we play basketball or volleyball".

SRM Institute of Science and Technology

Department of Mathematics

18MAB302T- Discrete Mathematics

UNIT–3 / Tutorials – 2

1. Write the dual for the following statements.

(i) $p \rightarrow (q \wedge r)$ (iii) $(a \vee b \rightarrow c) \rightarrow (a \wedge b \rightarrow c) \wedge F \equiv T$

(ii) $p \leftrightarrow q$ (iv) $\neg p \rightarrow (p \rightarrow q) \equiv T$

2. Check the validity "If it snows today, the university will close. The university is not closed today. Therefore, it did not snow today."

3. Show that the following argument is valid. "If today is Tuesday, I have a test in Mathematics or Economics. If my Economics professor is sick, I will not have a test in Economics. Today is Tuesday, and my Economics professor is sick. Therefore, I will have a test in Mathematics."

4. Check the validity of the following statement "If I work all night on this homework, then I can answer all the exercises. If I answer all the exercises, I will understand the material. Therefore, if I work all night on this homework, then I will understand the material."

5. Check the validity of the following:

"The ice cream is not vanilla flavored, the ice cream is either vanilla flavored or chocolate flavored, Therefore the ice cream is chocolate flavored"

6. Check the validity of the following:

If it rains we'll either go to the movies or stay home and watch basketball. But you're sick of basketball, so if it rains we'll go to the movies.

7. Show that

$\neg S$ follows from the premises $P \wedge Q$, $P \rightarrow \neg(Q \wedge R)$ and $S \rightarrow R$

8. Show that the conclusion B follows from the premises $\neg(A \vee B) \rightarrow C$, $\neg A$ and $\neg C$

9. Show that the conclusion C follows from the premises $\neg A \rightarrow (C \wedge D)$, $A \rightarrow B$ and $\neg B$

10. Prove that $\neg R \rightarrow S$ follows from the premises $P \rightarrow Q$; $\neg P \rightarrow R$ and $Q \rightarrow S$.