"TO OBTAIN TRUTH VALUES OF COMPOUND STATEMENT P_vQ BY USING SWITCH CONNECTIONS IN PARALLEL"

A PROJECT WORK SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE GRADE 11 SCIENCE IN MATHS

By

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CERTIFICATE OF APPROVAL

The project work entitled "TO OBTAIN TRUTH VALUES OF COMPOUND STATEMENT $P_V Q$ BY USING SWITCH CONNECTIONS IN PARALLEL" by Mr. _____ under the supervision of Mr. _____Of_____ _____, Nepal, is hereby submitted for the partial fulfillment of the requirement of Maths in Grade 11. This project work has not been submitted in any other school or institution previously for the award of Grade 11.

_____ _____

Supervisor: Head of the Department:

Department of Maths Department of Science

National Academy of Science National Academy of Science

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DECLARATION

I, _____ hereby declare that the project work entitled, "TO OBTAIN TRUTH VALUES OF COMPOUND STATEMENT P_VQ BY USING SWITCH CONNECTIONS IN PARALLEL" under the supervision of Mr. _____Of_____ _____ , Nepal, presented herein is genuine work done originally by me and has not been published or submitted elsewhere for the requirement of any degree program. Any literature, data, or works done by others and cited in this project work has been given due acknowledgment and listed in the reference section.

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1. Introduction:-

A declarative or assertive sentence is said to be a statement that is either true or false but not both at the same time. A statement that declares only one thing is known as a simple statement. A combination of two or more single statements is known as a compound statement.

In Boolean algebra, a truth table is a table showing the true value of a statement formula for each possible combination of truth values of component statements. A statement is a declarative sentence that has one and only one of the two possible values called truth values. Truth values are true and false denoted by the symbols T and F respectively, and sometimes also denoted by symbols 1 and 0. Since we allow only two possible truth values, this logic is called two-valued logic. The truth table is a powerful concept that constructs truth tables for its component statements. Whereas, unary logical operations are those operations that contain only one logical variable.

In logical mathematics, binary operations are logical operations that have two logical input variables. The most important binary operations are given below.

a) Conjunction:

A conjunction is a binary logical operation that results in a true value if both the input variables are true. This operator is represented by P AND Q or P $\wedge$ Q or P . Q or P & Q, where P and Q are input variables.

b) Disjunction:

Logical disjunction returns a true when at least input operands are true, i.e. either one of them or both are true. It is denoted by the symbols P OR Q, P $\vee$ Q or P + Q.

c) Implication or conditional:

Logical implication typically produces a value of false in the singular case that the first input is true and the second is either false or true. It is associated with the condition, "if P then Q" [Conditional Statement] and is denoted by P $\rightarrow$ Q or P $\Rightarrow$ Q.

d) Biconditional:

The equivalence P $\leftrightarrow$ Q is true if both P and Q are true or both P and Q are false.

It is associated with the condition, "P if and only if Q" [Biconditional Statement] and is denoted by P$\leftrightarrow$Q or P$\Leftrightarrow$Q.

2. Motivation:-

The truth table displays the logical operations on input signals in a table format. Every Boolean expression can be viewed as a truth table. The truth table identifies all possible input combinations and the output for each. It is common to create the table so that the input combinations produce an unsigned binary up-count.

Ludwig Wittgenstein is generally credited with inventing and popularizing the truth table in his Tractatus Logico-Philosophicus, which was completed in 1918 and published in 1921. Such a system was also independently proposed in 1921 by Emil Leon Post. An even earlier iteration of the truth table has also been found in unpublished manuscripts by Charles Sanders Peirce from 1893, antedating both publications by nearly 30 years.

3. Materials Required:-

- Switches
- Electric wires
- Battery
- Lamp/Bulb

4. Objective:-

This project helps in understanding the truth values of the compound statements pvq in different cases.

5. Method of Construction:-

- Connect switches S_1 and S_2 in parallel.
- Connect the battery and lamp so as to complete the circuit as shown in the figure.

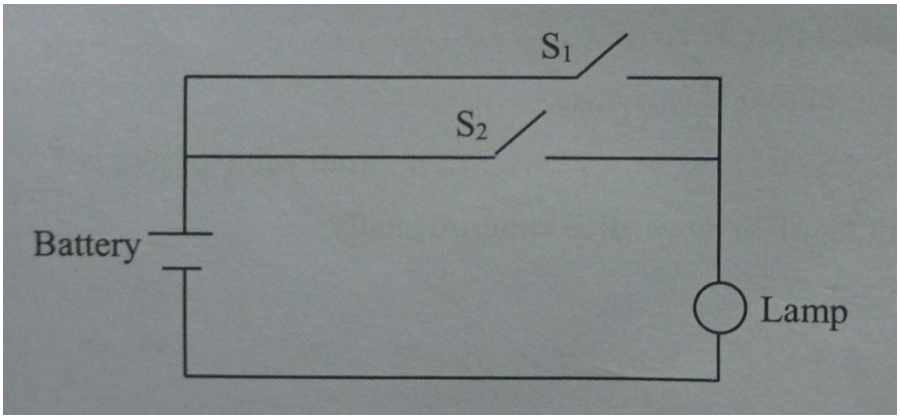

Fig. Parallel Switch Circuit for compound statement pvq

6. Demonstration:-

Switch S_1	Switch S_2	Status of Lamp
on	on	glow
on	off	glow
off	on	glow
off	off	not glow

The lamp will glow if at least one of the switches S_1,S_2 is on. This gives the following results:

Let p and q represent the statements as follows:

- p: S1 is on, truth value of p is T.
- ~p: S1 is off, truth value of p is F.
- q: S2 is on, truth value of q is T.
- ~q: S2 is off, truth value of q is F.

When the lamp glows, truth value of p v q is T. When the lamp does not glow, truth value of p v q is F. Thus, from the circuit, the following table gives the truth value of p v q:

p	q	p v q
T	T	T
T	F	T
F	T	T
F	F	F

7. Observation:-

a) If S1 is on, truth value of p is T.
   If S1 is off, truth value of p is F.
   If S2 is on, truth value of q is T.
   If S2 is off, truth value of q is F.

b) If S1 is on, S2 is on, truth value of p v q is T.
   If S1 is on, S2 is off, truth value of p v q is T.

If S1 is off, S2 is on, truth value of p v q is T.
If S1 is off, S2 is off, truth value of p v q is F.

8. Literature Review:-

Logic leads us to the conclusion that an object must be white if it is either black or white, and if it is neither black nor white. Be aware that applying logic to the above hypotheses will not clarify what "black" or "white" imply or explain why an object cannot be both.

In actuality, logic is the study of generic patterns of reasoning without consideration of specific context or meaning. Simple assertions can be combined in a variety of ways to create new ones. Connectives are the words that change or combine simple statements to create new statements or compound ones.

The English word "and" represents the basic connective (logical) conjunction, "or" represents the disjunction, and "not" represents the negation.

All throughout, we utilize symbol '$\wedge$' to denote conjunction; '$\vee$' to denote disjunction and the symbol '$\sim$' to denote negation.

9. Conclusion:-

Hence, the meaning of 'or' is verified experimentally.

From this experiment, we came to know about the history, purpose and importance of truth table and compound statement p v q. This experiment helps us doing a lot of research and also contributed us to understand the truth value and truth table which is an important context in our course. Now, we are able to calculate the truth value of disjunction statement.

10. Acknowledgement:-

I would like to express my special thanks of gratitude to my teacher Mr. _____ as well as our principal Mr. _____ who gave us the golden opportunity to do this wonderful project on the topic "TO OBTAIN TRUTH VALUES OF COMPOUND STATEMENT P_VQ BY USING SWITCH CONNECTIONS IN PARALLEL", which also helped me in doing a lot of research and I came to know about so many new things I am really thankful to them.

Secondly, I would like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.

11. References:-

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