WEEK 5 : LOGIC, ALGORITHMS & FLOW CHARTS

Logic: A particular method of reasoning or argumentation.

Types of Logic Symbols:

- "AND" logic : denoted by “ ^ " symbol.
- "OR" logic : denoted by “ v " symbol.
- "NOT" logic : denoted by “ ~ " or “ ~ " symbol.

In javascripts (or) programming languages these logics are represented by the following symbols:

- "AND" logic : denoted by “ && " symbol.
- "OR" logic : denoted by “ || " symbol.
- "NOT" logic : denoted by “ ! " symbol.

Propositions: A proposition is a statement that has certain truth value. i.e, a proposition can have a value either “true” or “false” but not both. Examples:

- “p: Sun rises in the east”
- “q: Grass is green”
- “r: 2 + 3 = 7”

“s: Close the door” , “t: Is it hot outside?” are not propositions.
Truth Tables of various Logic Symbols:

1)AND logic

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>(P ∧ Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>T</td>
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<tr>
<td>T</td>
<td>F</td>
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<td>F</td>
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</tbody>
</table>

2)OR logic

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>(P ∨ Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>T</td>
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<tr>
<td>T</td>
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<td>F</td>
<td>F</td>
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</tbody>
</table>

3) NOT logic

<table>
<thead>
<tr>
<th>P</th>
<th>¬P</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>F</td>
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<tr>
<td>F</td>
<td>T</td>
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</tbody>
</table>

4)IMPLIES logic

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>(P → Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>T</td>
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</tr>
</tbody>
</table>

- P ∧ Q is TRUE only when both P is true & Q is true, in all other cases it is FALSE.
- P ∨ Q is FALSE only when both P is False & Q is False, in all other cases it is TRUE.
- P → Q, read as “P implies Q” (or) “If P then Q”. P implies Q is false only when P is true & Q is false, in all other cases it is true.
Propositional Logic Examples:

- **P**: Chris is governor of New Jersey (NJ).
- **Q**: James is mayor of New Brunswick (NB).

- **P \land Q**: Chris is governor of NJ and James is mayor of NB
- **P \lor Q**: Chris is governor of NJ or James is mayor of NB
- **\neg P**: Chris is not governor of NJ
- **\neg P \land \neg Q**: Chris is not governor of NJ and James is mayor of NB
- **\neg P \lor \neg Q**: Chris is not governor of NJ or James is not mayor of NB
- **P \implies Q**: If Chris is governor of NJ then James is mayor of NB
- **\neg P \implies Q**: If Chris is not governor of NJ then James is mayor of NB
ALGORITHM: It is a precise, systematic method for producing a specified result.

(or)

Algorithm is a sequence of steps of a particular process which when implemented would give the desired result.

Example: Algorithm for processing a bill

1. Start the process of billing.
2. Order 2 Burger, 3 Pizza.
3. Calculate the Prices.
4. If (Total Cost > 10$) → free coupon.
5. else if Total Cost < 10$ → None.
6. Display the cost.
7. End the process

Flow chart:-

• A flow chart is a schematic / diagramatic representation of an algorithm.

• Primary purpose of flow chart is to show the design of an algorithm.

• A flow chart is a combination of symbols.
Flow chart Symbols:-
1) Start / stop symbol

- Shows the beginning or ending of an algorithm.
- RULE : Each algorithm should have only one entry point & one exit point.

2) Flow Lines

- Flow lines show the order or sequence of actions in a program.
- Flow lines connect the symbols of flow chart.

3) Connector

- We use a connector to show connectivity.
4) Process
- This shape represents a processing step in our algorithm.

5) Input / Output
- Used when we read input from a key board or when we output results on to the system console.

6) Decision
- It is used to represent an “if...else” statement.
- This shape indicates where the outcome of a point dictates the next step.
START

INPUT
2 BURGERS, 3 PIZZAS

TOTAL COST = (3B * 2$) + (2P * 3$)

TOTAL COST > 10$?

NO

DISPLAY TOTAL COST

STOP

YES

ISSUE FREE COUPON