Name- Fardouse Lomat Jahan Rumpa

ID - 22191700041

Department - B.Sc in CSE (E)

Batch - 17th

Subject code- CSI - 227
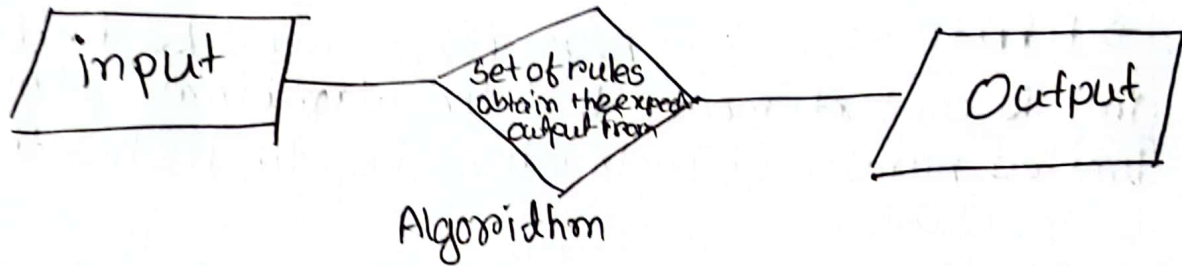
Subject title - Algorithm

Answer: Algorithm :

An Algorithm is a procedure used for solving a problem of performing a computation. Algorithms act as an exact list of instructions that conduct specified actions step by step in either hardware- or software-based routines.

Algorithms are widely used throughout all areas of IT. In mathmatics and computer science, an algorithm usually refers to a small procedure that sloves a recurrent problem. Algorithms are also used as specifications for performing data processing and play a major role in automated systems.

input — Set of rules obtain the expected output from — Output

Algorithm

Short list of categories:

Algorithm types we will consider include:
→ Simple recursive algorithms.
→ Back tracking algorithms.
→ Divide and Conquere algorithms.
→ Dynamic programming algorithms.
→ Greedy algorithms.
→ Branch and bound algorithms.
→ Brute force algorithms.
→ Randomized algorithms.

Characteristics of an Algorithm:

An algorithm has the following characteristics:

→ Input: An algorithm requires some input values. An algorithm can be given a value other than 0 as input.

→ Output: At the end of an algorithm, you will have one or more outcomes.

→ Unambiguity: A perfect algorithm is defined as unambiguous, which means that its instructions should be clear and straight forward.

→ Finiteness: An Algorithm must be finite. Finiteness in this context means that the algorithms should have a limited number of instructions. i.e. the instructions should be countable.

→ Effectiveness: Because each instruction in an algorithm affects the overall process, it should be adequate.

→ Language independence:

An algorithm must be language-independent, which means that its instructions can be implemented in any language and produce the same results.

Ans to the Qus NO: 01 (b)

Answer: <u>Advontages of algorithm:</u>

→ It is a step-wise representation of a solution to a given problem, which makes it easy to understand.

→ An algorithm uses a definite procedure.

→ It is not dependent on any programming language, so, It is easy to understand for anyone even without programming knowledge.

→ Every step in an algorithm has its own logical sequence so It is easy to debug.

→ By using algorithm, the problem is broken down into smaller pieces or steps hence, it is easier for programmer to convert it into an actual program.

<u>Disadvantoges of algorithm:</u>

→ Writing algorithm takes a long time

→ An algorithm is not a computer program. it is rather a concept of how a program should be.

Ans to the Qus NO: 01 (c)

Answer: <u>Types of algorithm:</u>

Algorithm types we will consider include:

> Simple recursive algorithms.

→ Back-tracking algorithms.

→ Divide and conquer algorithms.

→ Dynamic programming algorithms.

→ Greedy algorithm.

→ Branch and bound algorithms

→ Brute force algorithms.

→ Randomized algorithms.

Greedy algorithm:

In the Greedy algorithm, the solution is built part by part. The decision to choose the next part is done on the basis that it given an immediate benefit. It never considers the choices that had been taken previously.

Some common problems that can be slored through the greedy algorithm are Dijkstra Shortest path algorithm, Prim's algorithm, kruskal's algorithm, Huffman coding etc.

There are two properties in this algorithm.

→ Greedily choosing the best option.

→ optimal substructure property: if an optimal Solution can be found by retreiering the optimal Solution to its subproblems.

Greedy Algorithm does not always work but when it does, it works like a charm! this algorithm is easy to device and most of the time the simplest one. But making locally best decisions does not always work as its sounds. So, it is replaced by a reliable solution called Dynamic Programming approach.

Ans to the Qus NO: 02 (a)

Answer: Searching algorithm:

The algorithms used in searching are known as searching algorithms. Searching is a process using which one searches the desired element present in a group of elements. Various methods are used for searching, but the most popular ones are binary search algorithms and linear search algorithms.

Sorting Algorithms:

The algorithms used in sorting are known as sorting algorithm. Sorting refers to the operation in which we arrange the elements present in a table into a sequential order that complies with the ordering criteria. Sorting a basically performed according to the elements key value.

On the basis of a key's structure, the elements in a system can be stored alphabetically, numerically, or even alphanumerically. For instance, the elements present in a numerical sorting are arranged in descending order or ascending order, according to all of these elements numerical values.

Ans to the Qus NO: 02(b)

Answer: Huffman Coding:

Huffman Coding is a lossless data comperession algorithm. The idea is to assign variable-length codes to input characters, lengths of the assigned codes are based on the frequencies of corresponding characters. The variable-length codes are assigned to input characters are prefix codes, means the codes (bit sequences) are assigned in such a way that the code assigned to one character is not the prefix of code assigned to any other character. This is how Huffman coding makes sure that there is no ambiguity when decoding the generated bitstream.

Ans to the Qus NO: 02 (c)

Answer: Mathematical Algorithm:

A mathematical algorithm is a procedure for solving a given mathematical problem, commonly applied in the field of computer software related inventions.

"It has long been accepted that " intellectual information; a mathmatical algorithm, mere working directions and a scheme without effect are not patentable."

However, while a mathematical algorithm p may not be a manner of manufacture, the presence of

Such an algorithm within the steps in an otherwise patentable methods does not exclude a claim from patentability.

Graph Algorithm?

Graph Algorithms are a set of instructions that traverse (visits nodes of a) graph.

Some algorithm are used to find a specific node or the path between two given nodes.

A graph is an abstract notation used to represent the connection between pairs of subjects. A graph consists of -

→ Verticles - Interconnected objects in a graph are called vertices. Vertices are also known as nodes.

→ Edges - Edges are the links that connect the vertices.