Assignment-1 Part-1 (Written Task)

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Solution:

Q1:
Breath-first search (BFS) is a method for exploring a tree or graph. In a BFS, you first explore all the nodes one step away, then all the nodes two steps away.
Depth-first search (DFS) is a method for exploring a tree or graph. In a DFS, you go as deep as possible down one path before backing up and trying a different one.

Q2:

Depth limited search resolves the issue of being stuck in a graph of height infinite where DFS just keeps going down the nodes.

Q3:
A* is based on using heuristic methods to achieve *optimality* and *completeness*, and is a variant of the best-first algorithm. It evaluates nodes by combining goal cost and heuristic cost.

Q4:
Uniform cost search is of type uninformed search and take into account only goal cost whereas A* search is of type informed search and take into account both goal cost and heuristic cost.

Q5:

Algorithm	Complete	Optimal	
BFS	Yes	Yes	
DFS	No	No	
Uniform cost search	Yes	Yes	
A* search	Yes	Yes	---- graphs that are locally finite where the heuristics are admissible and monotonic.

Q6:

DFS ------- Last in first out
BFS ------- First in first out

Q7:

The most important property for the heuristic used in A* search is the admissibility which ensures that none of the values are overestimated.

Q8:

S --- B ---E ---F ---G

Q9:

Queue state at every step:

1.[S]
2.[A,B,C]
3.[B,C,E]
4.[C,E,D]
5.[E,D]
6.[D,F]
7.[F]
8.[G]
9.[]

Expanded Nodes: S,A,B,C,E,D,F,G

I am not using LIFO queue. If costs are ignored then it will for sure give optimal path.

Q10:

Queue state at every step:

1.[S]
2.[A,B,C]
3.[E,B,C]
4.[F,B,C]
5.[G,B,C]

Expanded nodes: S,A,E,F,G

I am not using FIFO queue. If values are ignored, then it may not have given the optimal path.

Q11:

Queue state at every step:

1. [S]
   17

2.[SC, SA, SB]
  16 18 14

3.[SA, SCD, SB]
   16 18 18

4.[SAE, SCD, SB]
   16 18 18

5.[SAEF, SCD, SB, SAEB]
    17 18 18 31

6.[SCD, SB, SAEFG, SAEFD]
   18 18 19 24

7.[SB, SAEFG, SCDF, SCDB]
   18 19 23 36

8.[SBD, SBE, SAEFG]
    14 15 19

9.[SBE, SBDF, SAEFG, SBDC]
   15 19 19 22

10.[SBEF, SAEFG, SBDF, SBDC, SBEA]
      16 19 19 22 27

11.[SBEFG, SAEFG, SBDC, SBEFD, SBEA]
       18 19 22 23 27

Since it is evident that SBEDF has the lowest f(n) value we choose this.
Visit order: S-- C-- A-- E-- F-- D-- E-- F --G

Q12:

yes it did find the optimal path.

Q13:

graph was locally finite where the heuristics were admissible and consistent.

Q14:
It did provide optimal path.

Q15:
A genetic algorithm is a search heuristic that is inspired by Charles Darwin's theory of natural evolution. This algorithm reflects the process of natural selection where the fittest individuals are selected for reproduction in order to produce offspring of the next generation.