Assignment — Artificial Intelligence

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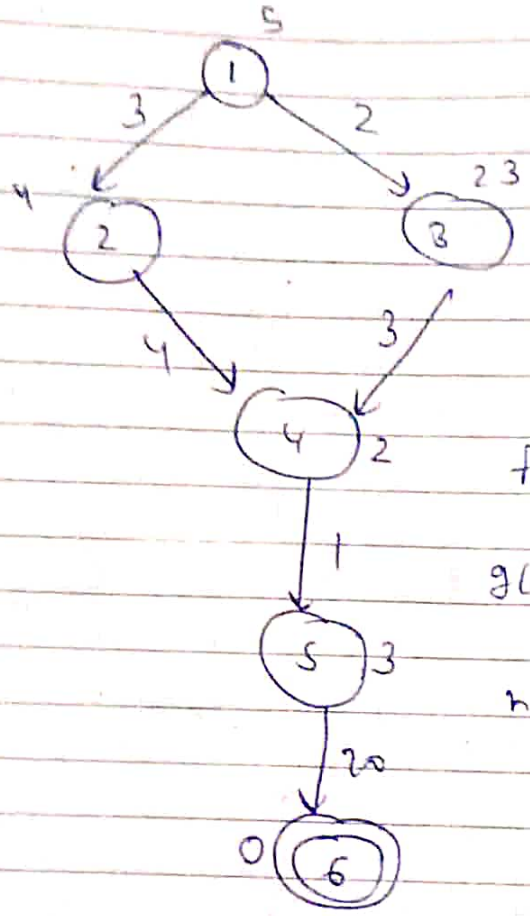
Q 3).

→ A* algorithm is a searching algorithm that searches for the shortest path between the initial and the final state. It is used in various applications, such as maps.



$f(N) = g(N) + h(N)$

$g(n)$ = Actual cost from start node to n

$h(n)$ = Elimination cost from n to goal node

Step (1)

From start node (1) we have two choices

(1) → (2) $f(2) = g(2) + h(2)$

$= 3 + 4$

$f(2) = 7$

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① → ③

$f(3) = g(3) + h(3)$

$2 + 23$

$f(3) = 25$

$\therefore f(2) < f(3)$

therefore we will traverse $f(2)$

① ② → ④

$f(4) = g(4) + h(4)$

$(3+4) + 2$

$f(4) = 9$

~~still~~

still this path costs less than ① → ③

$\therefore$ we will continue

① ② ④ → ⑤

$f(5) = g(5) + h(5)$

$(3+4+1) + 3$

$f(5) \rightarrow 11$

still $11 < 25$ we will continue

① ② ④ ⑤ → ⑥

$f(6) = g(6) + h(6)$

$(3+4+1+10) + 0$

$f(6) = 28$

we reached goal state but it costs more as $28 > 25$ $\therefore$ we will traverse our old path

① ③ → ④

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$f(4) = g(4) + h(4)$

$= (2+3) + 2$

$f(4) = 7$

Still less : continue

(1)(3)(4) → (5)

$f(5) = g(5) + h(5)$

$(2+3+1) + 3$

$f(5) = 11$

Still less : continue

(1)(3)(4)(5) → (6)

$f(6) = g(6) + h(6)$

$= (2+3+1+20) + 0$

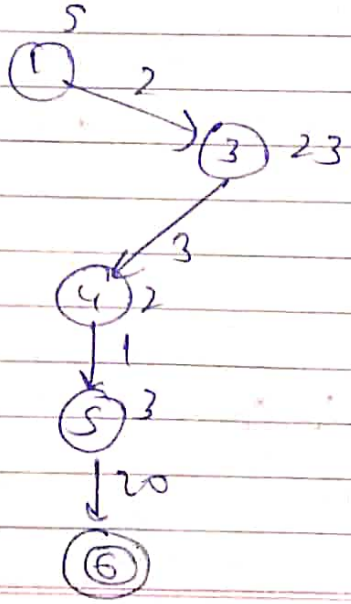
$= 26$

$[f(6) = 26]$

This is less than that of 28

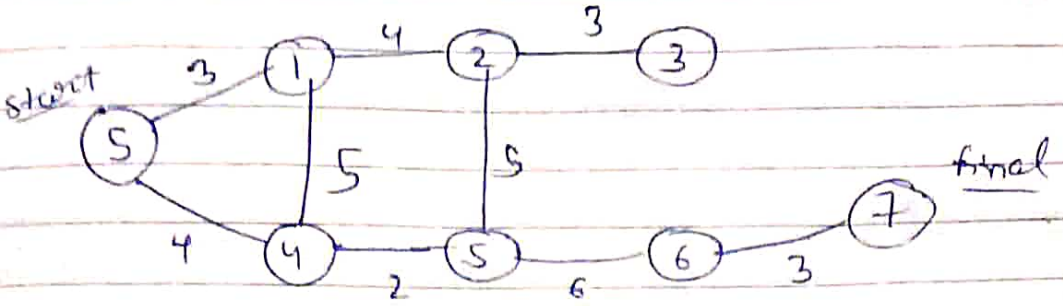
∴ optimal

Hence, final shortest path will be



Q2).

- Breadth first Search
  - ↳ Uninformed search technique
  - ↳ we use Queue here



Step (I) queue

| S |

Now, will put both children of S in queue

| 1 | 4 |

Now, both children of 1

| 4 | 2 |

Now, both children of 4

| 2 | 5 |

Similarly | 5 | 3 |

| 3 | 6 |

| 6 | 7 |

| 7 |

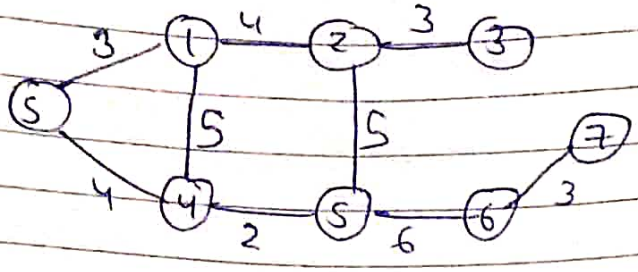
Dequed element

S 1 4 2 5 3 6 7

Therefore order of traversal will be (Path)

S → 1 → 4 → 2 → 5 → 3 → 6 → 7

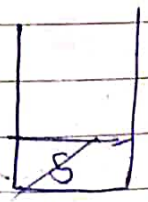
- Depth first search
  - ↳ Uninformed search technique
  - ↳ Stack



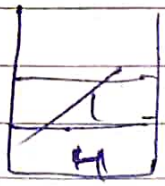
Pop elements

5 1 2 3 5 6 7

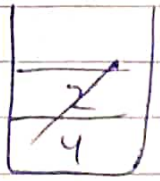
Initially



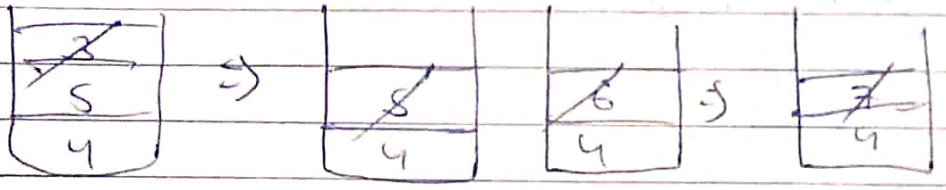
After removal of S both its child will keep



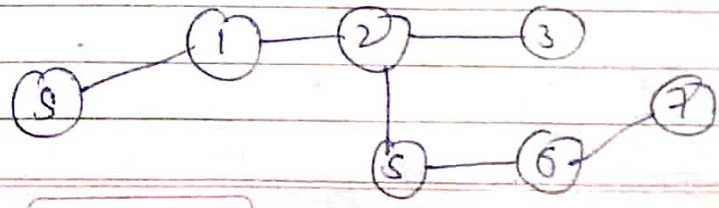
Now, child of 1 is 2 and 4



Similarly



∴ path will be



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- Uniform cost search (Dijkstra)

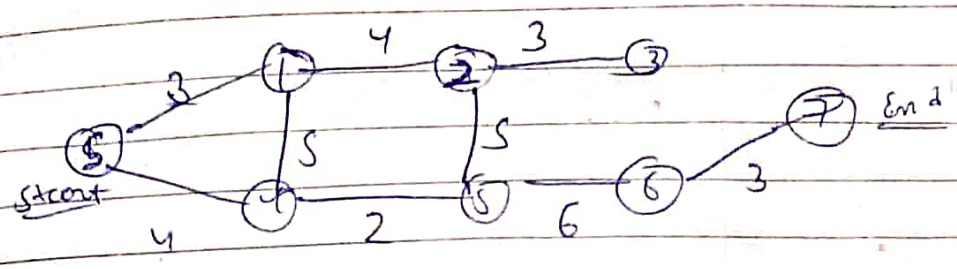
↳ single source shortest path

we use concept of Relaxation

If $d(u) + c(u,v) < d(v)$

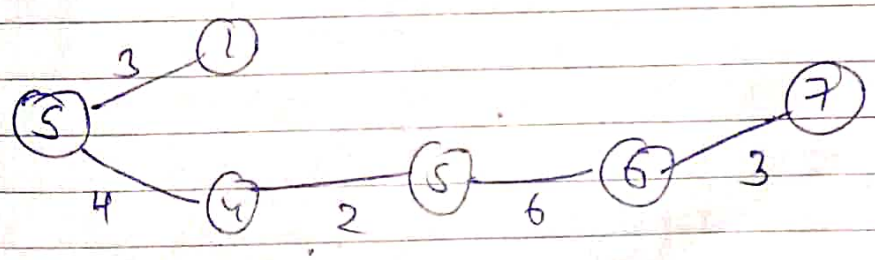
then $d(v) = d(u) + c(u,v)$

It traverse in BFS fashion but with shortest cost



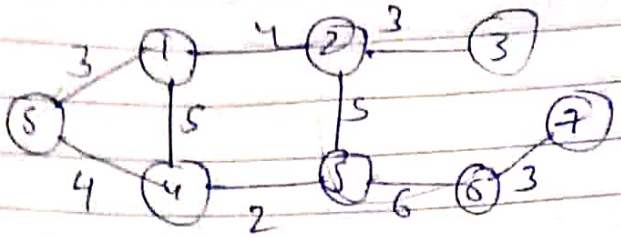
source	Destination						
S	1	4	2	5	3	6	7
	∞	∞	∞	∞	∞	∞	∞
~~S,3~~	(3)	4	∞	∞	∞	∞	∞
S, 1	(3)	(4)	7	∞	∞	∞	∞
S,1,4	(3)	(4)	7	(6)	∞	∞	∞
S,1,4,5	(3)	(4)	7	(6)	∞	(6)	∞
S,1,4,5,6	(3)	(4)	7	(6)	∞	(6)	(3)
S,1,4,5,6,3	~~(3)~~	4					

∴ path we get S, 1, 4, 5, 6, 3



DFID (depth first Iterative search)

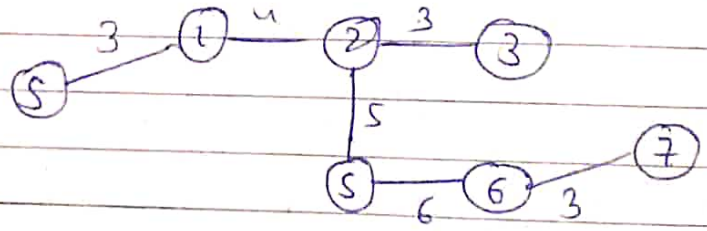
↳ Combination of BFS and DFS



we search level wise in DFS fashion

Depth or level	Iterative deepening
0	S
1	S → 1 → 4
2	S → 1 → 2 → 4 → 5
3	S → 1 → 2 → 3 → 4 → 5 → 6
4	S → 1 → 2 → 3 → 5 → 6 → 7

∴ Path will be



Q1).

→ A problem characteristics plays a major role in selection of AI techniques. It helps in analysing the problem with the

following considerations.

- Is the problem decomposible
  - for Ex. Very large and composite problem can be easily solved if we can break it in smaller problems and we can use recursion.

- Can the solution steps involved be completly ignored or undone.
  - for Ex problem falls under 3 classes Ignorable, recoverable and irrecoverable we can proceed further since nothing lost by this redundant step (ignorable) when we can backtrack and undo unwanted moves (backto recoverable) when we can't backtract and ignore steps then problem becomes irrecoverable

- Is the problem universally predictable,
  - In certain outcome problems, planning, could be done to generate sequence of operations that guaranteed to lead solution.

- Is good solution absolute or relative.
  - Ex: In water jug & puzzle problems, we are satisfied with the solution, unmindful of solution path taken, for best paths problems all possible paths are reported using an exhaustive search.

- The knowledge base is consistent or not.
  - when we evaluate boolean expressions, then knowledge base contains theorems,

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and laws of boolean algebra which are always true whereas when know edge base is based on prediction and cost which varies with respect to time.

- what is the role of knowledge
  - Let say, the game of chess. just the rules for determining legal moves and also some simple control mechanism are sufficient to arrive at a selection but additional knowledge about the game might help to constraint the search and speedup the execution.

- Does task requires interaction with the person

  - Conversation here there will be intermediate communication b/w person and computer, to provide assistance to computer or information to users.

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