Roll No. _____

NATIONAL UNIVERSITY OF MODERN LANGUAGES ISLAMABAD
DEPARTMENT OF SOFTWARE ENGINEERING
Mid-Term Examination – Spring 2023 – BSSE V (Afternoon)

Subject: Artificial Intelligence **Instructor: Mr. Farhad M. Riaz**
Allowed Time: 02 Hours **Total Marks: 25**

Instructions: -
i. Attempt all questions and return the question paper with the answer sheet.

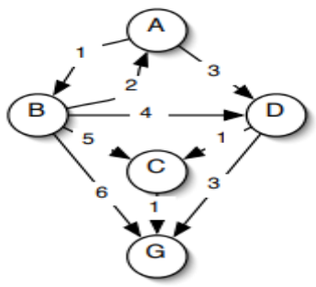
QUESTION 1 [CLO-1]

Suppose you are asked to design the Moon Rover. The Moon Rover Leave its lander, collect some stone sample from three different places on the moon's surface, the order of pick has any order, and return to the lander. The Moon Rover used its navigation system to move the surface. The nature of the actions is primitive like going to the lander, going to stone 1, going to stone 2, and then to stone 3. Suppose the time interval between the traversal of locations is known. Your goal is to find the sequence of actions that will perform the above task in the shortest amount of time.

a. Formulate this problem as a search problem by specifying the state space, initial state, path-cost function, and goal test **[05]**
States: (current-location, have-rock1?, have-rock2?, have-rock3?)
Initial state: (lander, no, no, no)
Path cost: sum of arc costs; arc cost = distance between locations
b. Goal test: (lander, yes, yes, yes)
c. Which search technique would be most appropriate, and why **[02]**
We might use A*, since it will probably be faster and there's a reasonable heuristic available. We may also use Uniform Cost Search

QUESTION 2 [CLO-1]

Please consider the Graph below



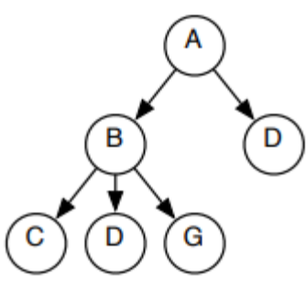
Your goal is to reach the goal with optimal cost. Suppose you are asked to perform the uninformed search.

a. What do you mean by an uninformed Search? **[02]**

An uninformed search is a searching technique that has no additional information about the distance from the current state to the goal.

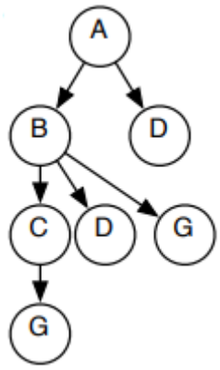
b. Which uninformed Search gives you the optimal search? Justify your answer to discuss all possible paths produced by each search. **[05]**

Breadth Frist Search



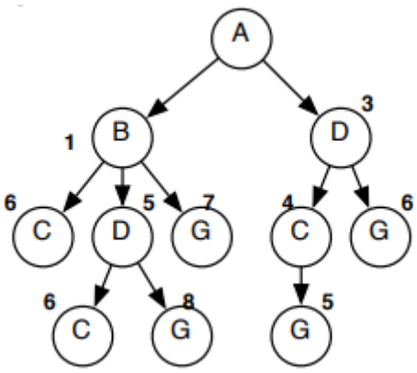
Optimal: No. Breadth first search is only guaranteed to find a path with the shortest number of links; it does not consider link cost at all.

Depth First Search



Optimal : No. Depth first search is an any-path search; it does not consider link cost at all.

Uniform Cost Search



Optimal: Yes. Uniform Cost is guaranteed to find a shortest path.

QUESTION 3 [CLO-2]

For the Scenario discussed in **Question 1**

a. What would be the admissible, heuristic evaluation function for the problem? **[02]**

One possible heuristic evaluation function for a state would be the amount of time required for the robot to go back to the lander from the location of the state..."

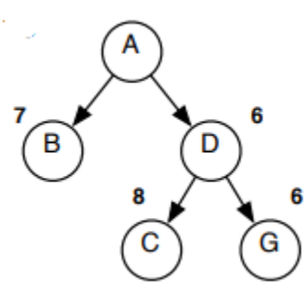
By using the Scenario from Question 2. Now we have added two heuristic values. The heuristic value of the Goal is 0. Now your goal is to perform the informed search.

	H1	H2
A	3	3
B	6	3
C	4	0
D	3	2

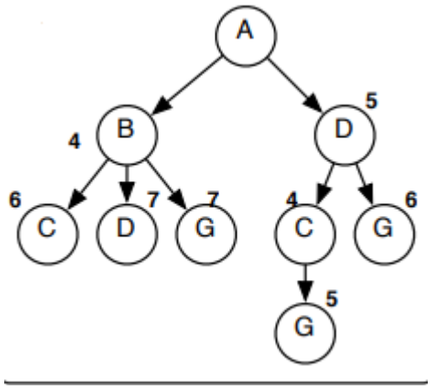
b. What do you mean by an informed Search? **[02]**

c. Which informed Search gives you the optimal search? Justify your answer to discuss all possible paths produced by each search. **[05]**

A * using H1

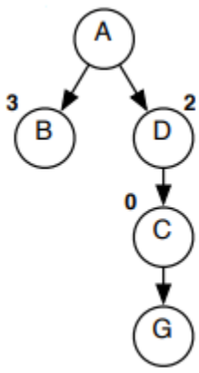


A * using H2

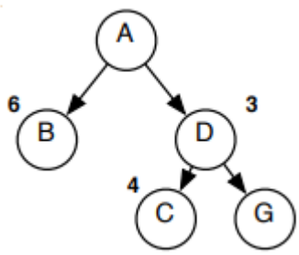


Optimal: Yes. Though best first search is not guaranteed to find an optimal path, in this case it did

Best First Search Using H2



Best First Search Using H1



Optimal: No. Best first search is not guaranteed to find an optimal path. It takes the first path to goal it finds.

d. Is the search admissible? **[02]**

Under the H2 the search is admissible