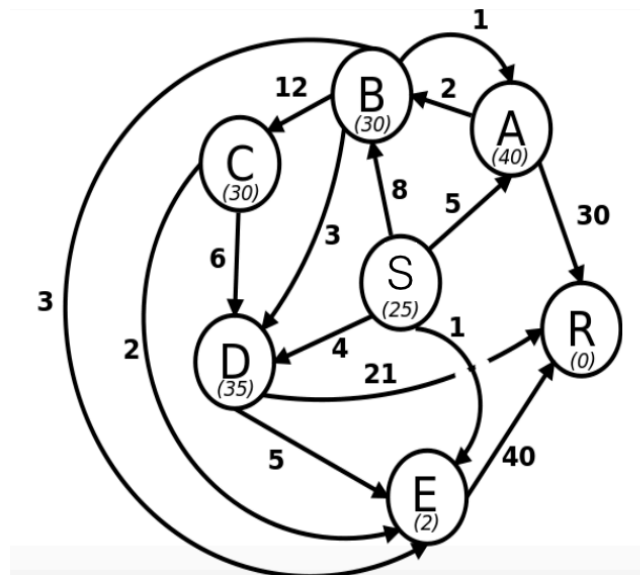


**Sultan Qaboos University**  
**Department of Computer Science**  
**Introduction to Intelligent Systems**  
**COMP3600 Spring24**  
**Homework Assignment 1 Due 7/3/2024 at 11:59pm**

Assume the following graph represents the future options you have after you graduate from SQU. Assume the start node is S = SQU and your goal node is R = Retire, with different options in between for what you can do between you graduate from college and retirement.

The edge distances represent, roughly, the “cost of transition” between different careers. You also have heuristics of node-to-goal distances which roughly represent the number of years you have to work until you retire. For example, it may take ~25 years to go from SQU (S) to retirement (R) while it may roughly take 30 years from Grad School (B) to retirement, but only 2 years from being an Entrepreneur (E) to retirement (R).

A = Industry | B = Grad School | C = Professor Job | D = Government | E = Entrepreneur



Use alphabetical order to break ties when deciding the priority to use for extending nodes.

**Part1: Answer the following questions and provide the answer in a PDF file named part1\_ID.pdf**

1. **[1pts]** Using a basic (uninformed) search algorithm you learned in this course, find a path with the minimum search efforts to go from S to R. What algorithm did you decide to use?
2. **[2pts]** Using the algorithm you chose in the previous part, draw the search tree and **[1pts]** give the final path .
3. **[4pts]** Use A\* to find a path from S to R. Use this space to draw the corresponding search tree and show your work. **[1pts]** What is the path cost?
4. **[1pts]** Is the provided heuristics to the goal admissible? Explain your answer.

**Part2. Write a Python program to implement Breadth-first-Search, Depth-first-Search, Uniform-Cost Search, Hill-Climbing, and A\* algorithms while considering the following requirements:**

- Use appropriate data structure for the search graph.
- Implement a function (or method) to find the neighbor(s) of a node in the graph.
- Display the result of each iteration (frontier and expanded nodes).
- Display the path found given any start state and goal state.
- Display the path cost.
- Submit all the solution files of your implementation
- For optimal search algorithms, you need to consider the edge cost.

**Submission instructions:**

Create a folder and name it hw1\_ID, where ID is your student ID.

*Clearly state and list any resources or references you used while working on this homework assignment in a file named README\_ID.txt.*

Put your solution files and the README file in hw1\_ID folder. Compress it and upload it to Moodle. Read the information and instructions on page 4 before submitting your work.

Grading Table:

Item	Marks
Breadth-First algorithm (queue, frontier, path)	5
Depth-First algorithm (queue, frontier, path)	5
Uniform-Cost algorithm (queue, frontier, path)	5
Hill-Climbing	5
A* algorithm	8
Appropriate data structure for the graph	5
Find the neighbor(s) of a given node in the graph	2
Compute the path cost	5
Attempts to find the optimal path (for optimal search)	2
Display the path	5
Three files are there in the submission folder ID.pdf, ID.py, and README_ID.txt	3

**Department's Late Submission Policy:**

- (a) 1-24 hours: 25% of the mark will be deducted.
- (b) > 24 hours: Not accepted.

**Department's Policy for Dealing with Cheating:**

It is essential that *each student solves all programming assignments, lab tests and exams individually* unless instructed otherwise, e.g., for group projects. Copying, plagiarism, collusion, switching, and falsification are violations of the university academic regulations. Students involved in such acts will be severely penalized. The department has adopted a firm policy on this issue. *A zero mark will be assigned the first time a student is caught involved in copying and his/her name will be added to a watch list maintained by the Head of Department. Further repeated involvements in copying will cause the student to get an F grade in that course. This is in line with the university academic regulations.*

**By uploading your homework file on moodle and clicking submit YOU ARE ACKNOWLEDGING THAT YOU ARE SUBMITTING YOUR OWN SOLUTION WHICH YOU HAVE WORKED ON INDIVIDUALLY.**

**CODE OBTAINED FROM THE INTERNET IS NOT ACCEPTABLE**

**CODE MODIFIED FROM ANOTHER CODE OBTAINED FROM THE INTERNET IS NOT ACCEPTABLE**

**CODE GENERATED by AI IS NOT ACCEPTABLE**

**CODE OBTAINED FROM ANOTHER PERSON IS NOT ACCEPTABLE**