1. Using the corresponding letter labels, give a formal description of this semester’s puzzle by defining the (a) initial state, (b) actions function, (c) transition model, (d) goal test, and (e) path cost function. [10]

2. Is Euclidean distance an admissible heuristic for this semester’s puzzle? Justify your answer. [3]

3. Disregarding whether Euclidean distance is or is not an admissible heuristic for this semester’s puzzle, if an admissible heuristic other than Euclidean distance exists for this semester’s puzzle, then state it and justify why it is admissible; otherwise justify why it does not exist. [3]
The following questions are about the following state space graph. Let A be the initial state and K the goal state. The edge labels indicate step-cost, the vertex labels contain the node identifier in the form of a letter. Heuristic \( h(s) \) is defined by the values following the node labels in the state space graph; for example, \( h(A) = 6 \). The order in which successors are generated is counterclockwise, ending at exactly 9 o’clock. Example: A generates first B and then I. When sorting by f-value, nodes with equal f-value are ordered such that the earlier a node is generated, the higher its priority. Nodes already on the frontier have higher priority than newly added nodes with equal f-value.

You may use the following abbreviations without defining them: DLR = Depth Limit Reached, NGF = No Goal Found, GF = Goal Found.


5. Is UCTS complete for this problem? Justify your answer. [1]

6. Is UCTS optimal for this problem? Justify your answer. [2]

7. Give the execution trace for Depth-Limited Graph Search (DLGS) with a depth-limit of 4. [5]

8. What is the diameter of this state space? Justify your answer. [2]

9. Is DLGS with a depth-limit of 4 complete for this problem? Justify your answer. [1]

10. Would DLTS with a depth-limit of 4 be complete for this problem? Justify your answer. [3]

11. Give the execution trace for Iterative Deepening Depth First Tree Search (ID-DFTS). [10]

12. Is ID-DFTS optimal for this problem? Justify your answer. [1]

13. Give the execution trace for Greedy Best-First Graph Search employing heuristic \( h \). [5]

14. Give the execution trace for \( A^* \) Tree Search (A*TS) employing heuristic \( h \). [5]

15. Is for this problem \( h \) admissible? Justify your answer. [2]

16. Is for this problem \( h \) consistent? Justify your answer. [1]

17. Is \( A^* \)TS employing heuristic \( h \) optimal for this problem? Justify your answer. [1]

18. If \( h(A) \) was equal to 5 instead of 6, would for this problem \( h \) be consistent? Justify your answer. [3]