Graded Assignment 1

Artificial Intelligence

## Monsoon Semester 2020

Max Marks: 30

Note: Write all the answers in your handwritten-on sheets or in your note book for questions 1-3. Take a picture of each page and create a single pdf file. Give the pdf file your name and upload on your google classroom. For question 4, upload both the code and the screen shot of the output.

Question 1: Consider a state space where the start state is number 1 and each state k has two successors: numbers 2k and 2k + 1.

   a. Draw the portion of the state space for states 1 to 16.
   b. Suppose the goal state is 11. List the order in which nodes will be visited for breadth first search, depth-limited search with limit 3, and iterative deepening search.

[4+3=7 Marks]

**Question 2:** Fill in the internal node values in the following game tree:

5 4 3 6 4 3 7 4 3 7 8 9 9 8 7 9 2 2 3 8 2 4 4 4 4 3 4
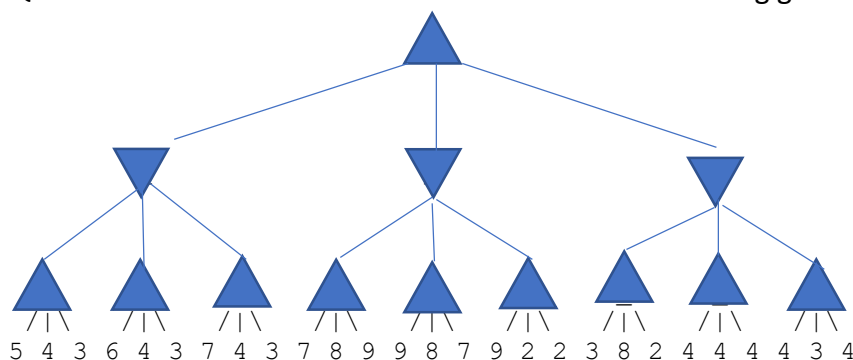
Also, use α-β pruning and identify the branches that can be pruned.

[4+3=7 Marks]

Question 3: Show how a single ternary constraint such as "A + B = C" can be turned into three binary constraints by using an auxiliary variable. Assume finite domain for values. Next, show how constraints with more than three variables can be treated similarly. Finally, show how unary constraints can be eliminated by altering the domains of variables.

[2+2+2=6 Marks]

Question 4: Consider the following maze to reach from Z to A,
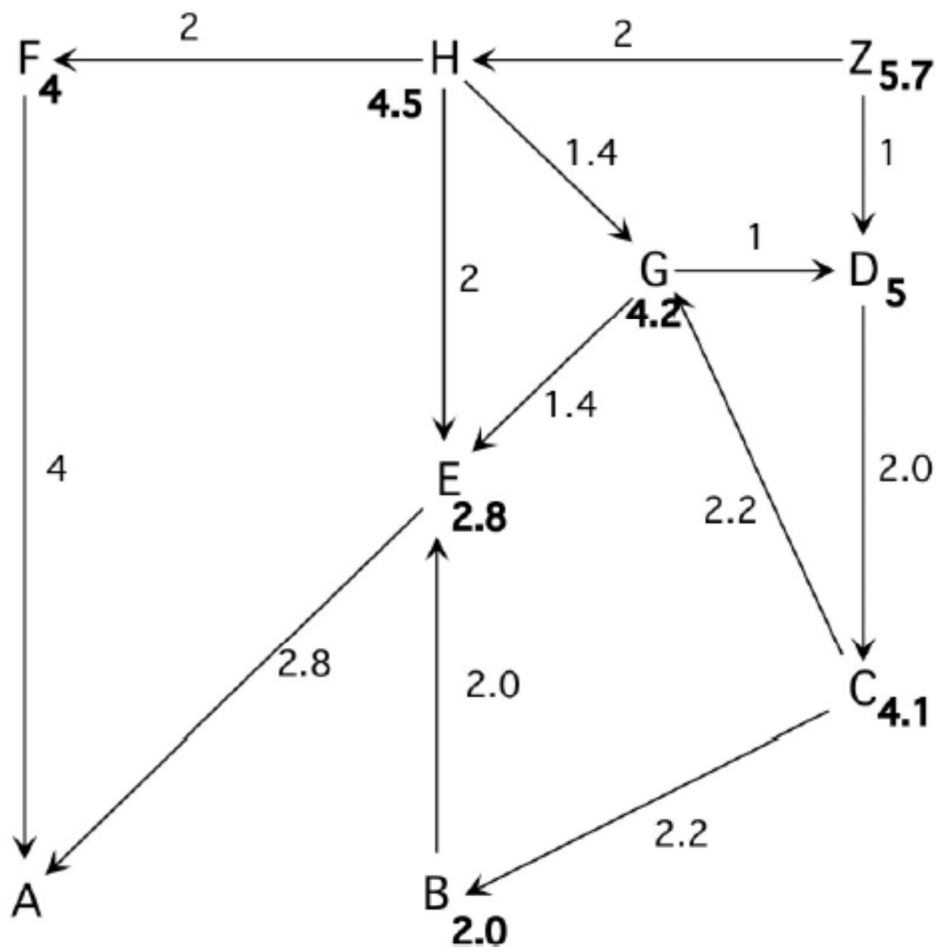
The edges cost and that on nodes is given above. Heuristic function is the difference of the alphabets i.e. enumerate {A=1, B=2, C=3, ..., Z=26}. Heuristic function at Z will return 26-1=25.

Implement A* algorithm in any language of your choice to find a path from Z to A. The output of the program should be the complete path chosen. Take a screen shot of the output and upload it along with your code.

Think about some other heuristic function which can improve the performance of A* in this case.

[8+2 Marks]