Question 1: Search Algorithms [50]

a) [10] 3 marks reduced for correct order of expansion but incorrect output path.

b) [10] 3 marks reduced for correct order of expansion but incorrect output path.

c) [10] 3 marks reduced for correct order of expansion but incorrect output path.

2 marks reduced for not considering the states that should be repeated

d) [10]

e) [10] 2 marks reduced for incorrect value of \( f(n) \). 2 marks reduced for stopping just after finding the goal state.

Question 2: A* Search Programming [50]

In this question, we have prepared 5 test cases and each of them be tested for three different modes. For each output files, we will compare separately its three output with standard ones, including the final goal state, operation sequences and the number of states popped out.

Different test cases, modes and, outputs all have their own weights. The weights for different test cases, modes and outputs are 1 : 1 : 1 : 1 : 1, 2 : 1 : 1 and 1 : 1 : 1. All these weights will be normalized before sending for computing the score.

Apart from comparing your results with standard, this time we also put a hard time limit for each mode, which are 1s, 15s, 5s. Since these time limits are at least 5 times longer than our program’s running time(for mode 3 we use \( h(s) = 1 \) if \( s \) is a goal), we assume your programs are capable of giving results within these limits as long as they are correctly implemented.

Moreover, your program will only be judged as correct for mode 3 only if the result satisfies these three conditions: 1) the length of operation sequence has the same length as those computed with mode=1 or mode=2. 2) the goal state can be generated by the outputted operation sequence. 3) the number of popped states should be smaller than the one computed with mode=2. Moreover, if your program runs out of time for mode 3, it will also be judged as incorrect, but this usually indicates condition 3 is not satisfied.

Finally, suppose \( X_{ijk} \) is the judging result for \( i-th \) test case, mode \( j \) (\( j = 1 \) or 2), \( k-th \) output, and \( Y_i \) is the judging result for \( i-th \) test case, mode 3, \( k-th \) output, then your score will be calculated based on the following formula:

\[
\text{score} = \sum_{i=1}^{5} \sum_{j=1}^{2} \sum_{k=1}^{3} w_{\text{case}}^i \cdot w_{\text{mode}}^j \cdot w_{\text{output}}^k \cdot X_{ijk} + \sum_{i=1}^{5} w_{\text{case}}^i \cdot Y_i
\]