CSE 422 (Artificial Intelligence)
Assignment 1 for section 16 and 17
Submission deadline: 17.11.24
** Submission must be in hand written and in hard copy format

1. Find the most cost-effective path to reach the final state from initial state using A* Algorithm. Consider g(n) = Depth of node and h(n) = Number of misplaced tiles.

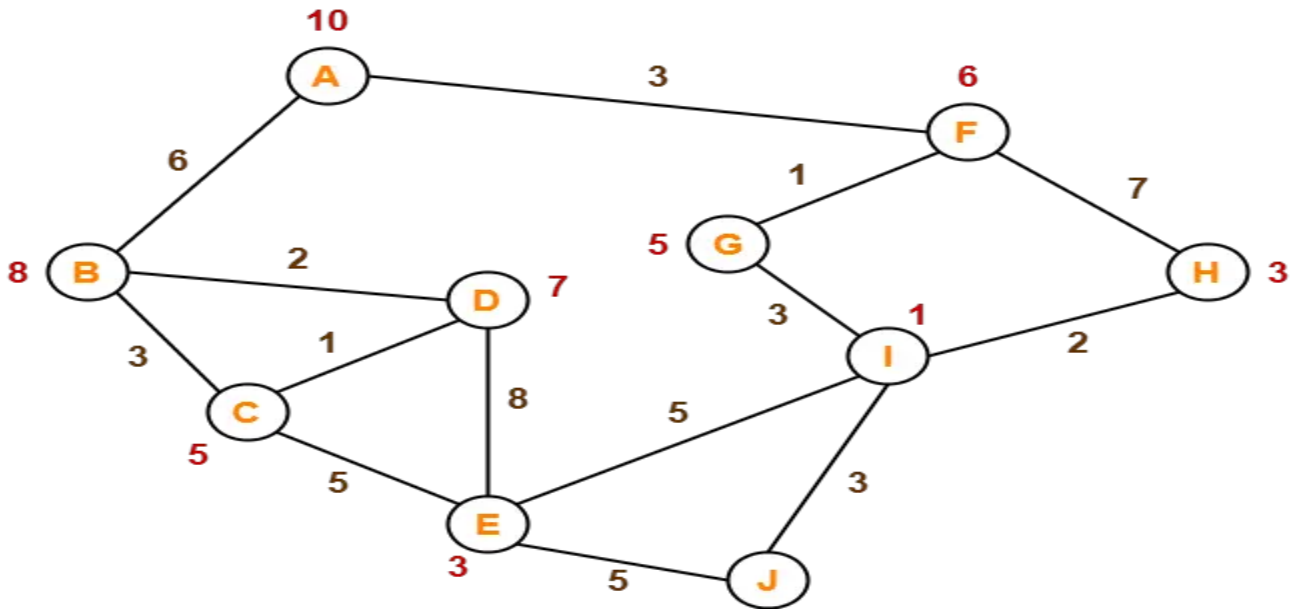
2	8	3
1	6	4
7		5

Initial State

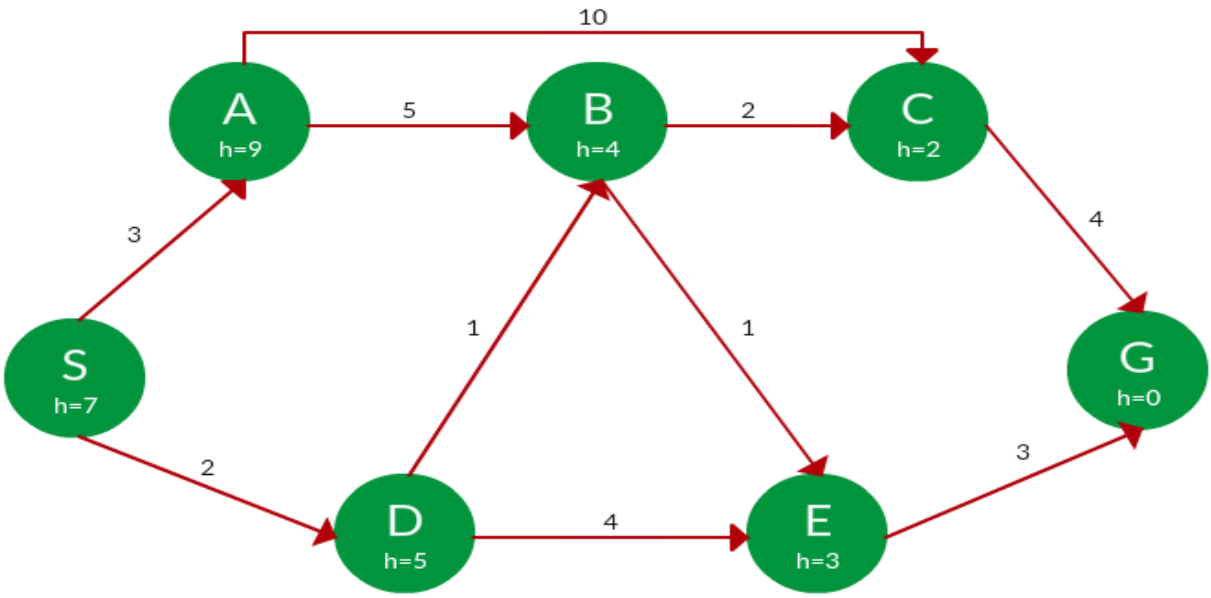
1	2	3
8		4
7	6	5

Final State

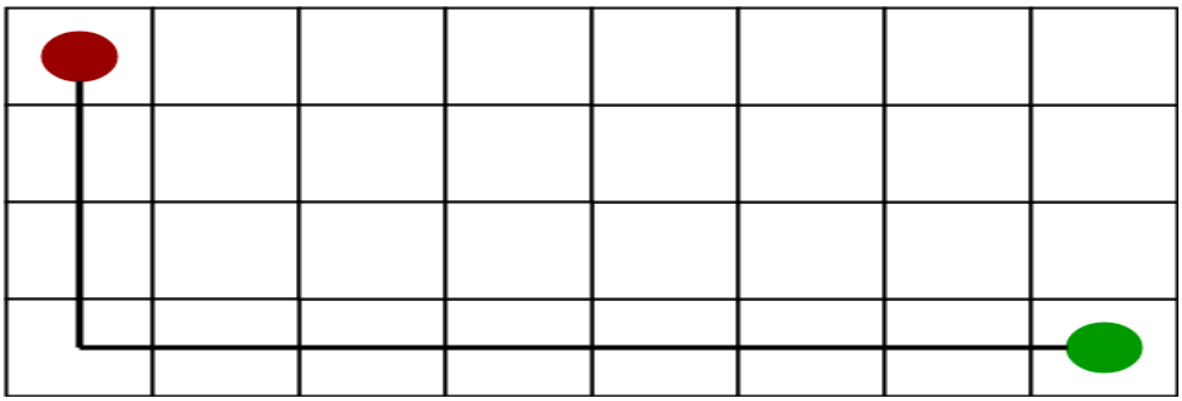
2. The numbers written on edges represent the distance between the nodes.The numbers written on nodes represent the heuristic values. Find the most cost-effective path to reach from start state A to final state J using A* Algorithm.



3. Find the optimal path from S to G using A* search



4. Find the shortest route from red spot to green spot. The given path is just an example of a path. Use A* search algorithm. (Hint: Mark the cells (1,1), (1,2),……..(1,8) for the bottom most row, mark the cells (2,1), (2,2), …….(2,8) for the 2nd row from the bottom and so on. Calculate distance between two cells using formulas from coordinate geometry



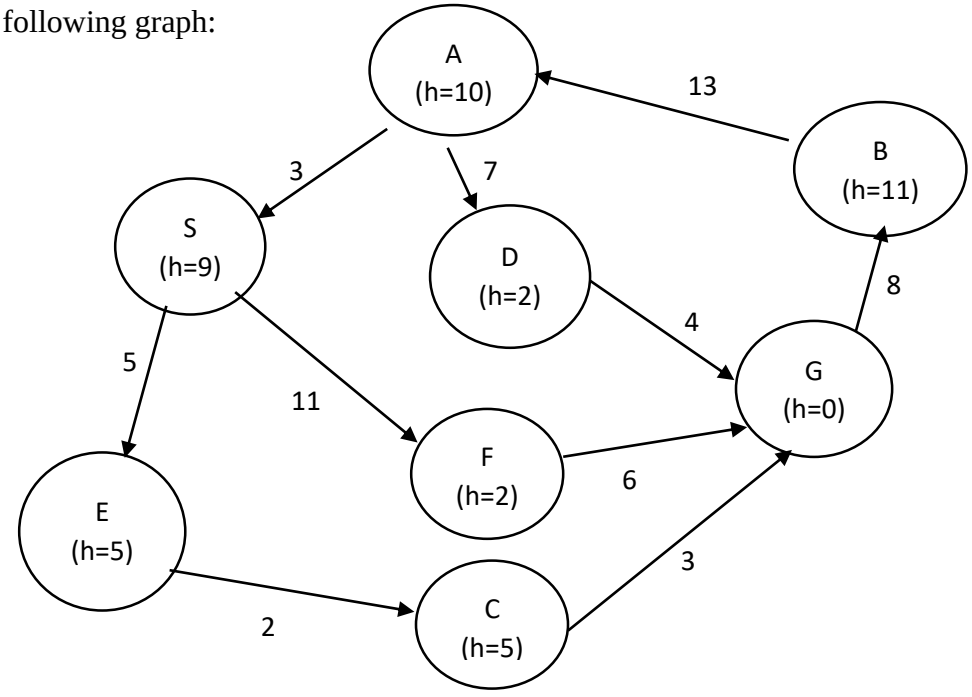
5. During A* search the leaves of the search tree contain a suboptimal goal and an ancestor of the optimal goal along with other nodes. Which node will A* search select and why?

6. (a) The following table shows g and h values of different nodes of an A* search tree. Now answer the following:
   (i) Which is the start node?
   (ii) Which is the goal node?
   (iii) What is the optimal path cost from start node to goal node?
   (iv) Arrange the nodes in order of expansion by A* search algorithm.
   (v) which nodes will not be expanded?

Node	g(n)	h(n)
A	239	176
B	291	380
C	220	193
D	0	375
E	140	253
F	118	329
G	75	374
H	420	0
I	366	160
J	317	100
K	455	160

7. Why larger valued heuristic expands less number of nodes compared to less valued heuristic?

8. Consider the following graph:



Here **S** is the starting node and **G** is the goal node. Now change only the heuristic values of **some** nodes so that the heuristic values become both admissible and consistent. Mention the updated values and corresponding node names.

9. You have to measure 1liter water using a 5 liter and 3 liter can. You can fill in the can with water from tap, you can throw water from a can on the ground and you can pour water from a can into another. Solve the problem using greedy heuristic search algorithm

10. In simulated annealing search if the search reaches global maximum, it cannot come down. But if it reaches a local maximum, it can come down. Why?

11. What is the role of synthetic temperature in simulated annealing search?

12. Find the value of x for which $x^3-3x^2+3x+10 = 19$ using genetic algorithm. Assume the value of x between 0 to 9. Use the population size 4

13. Simulate 8 queen problem using genetic algorithm for 2 cycles. Assume the population size is 4