University of Asia Pacific
Dept. of Computer Science and Engineering
Class Test – 02, Spring-24
Course Code: CSE 403 Course Title: Artificial Intelligence and Expert Systems
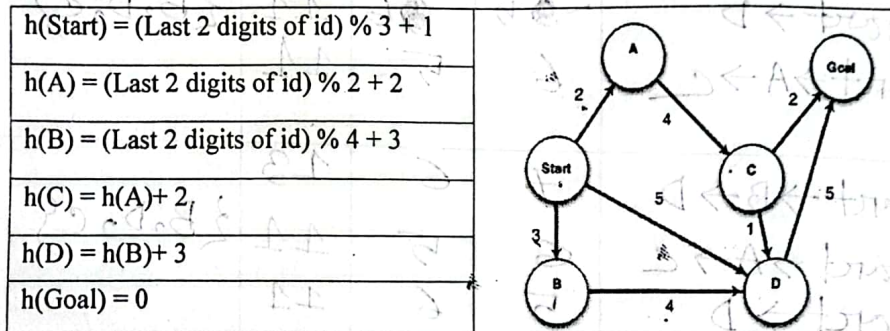Total Marks: 10, Time: 30 Mins   Date:16/10/24

Answer the following Question

1. Your target is to reach the goal node 'G' from the start node 'Start' with the optimum cost. [10]
Simulate the following graph problem with **A* search algorithm** and show the shortest path **with the fringe** for **each** iteration. Assume that states with earlier alphabetical order are expanded first. There are 6 nodes in the graph where the heuristics values of the 5 nodes are as follows. Here **% refers to mod** operation. You have to draw the Search Tree.

h(Start) = (Last 2 digits of id) % 3 + 1	
h(A) = (Last 2 digits of id) % 2 + 2	
h(B) = (Last 2 digits of id) % 4 + 3	
h(C) = h(A)+ 2	
h(D) = h(B)+ 3	
h(Goal) = 0	

Here,

$$h(Start) = (29\%3) + 1 = 2 + 1 = 3$$
$$h(A) = (29\%2) + 2 = 1 + 2 = 3$$
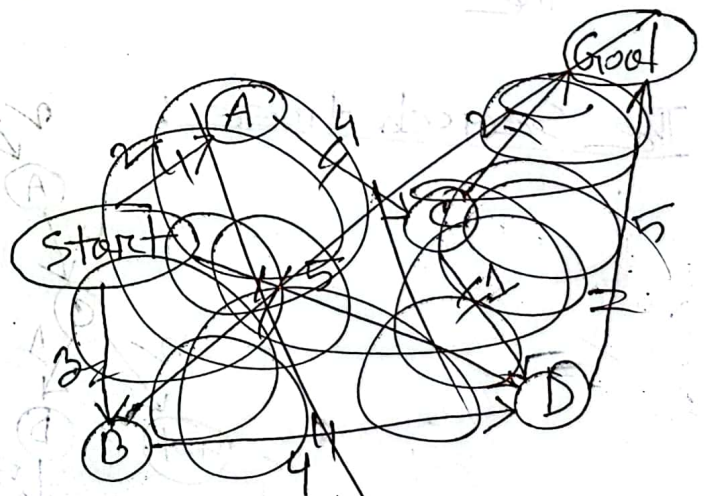$$h(B) = (29\%4) + 2 = 1 + 2 = 3$$
$$h(C) = h(A) + 2 = 3 + 2 = 5$$
$$h(D) = h(B) + 3 = 3 + 3 = 6$$
$$h(Goal) = 0$$

n	cost
Start	3
A	3
B	3
C	5
D	6
Goal	0

Iteration	Path	g(n)	h(n)	f(n)	O-F	C-F
Initialize	Start	0	3	3		
Iteration1	Start→A	2	3	5	{A, B, D}	{S}
	Start→B	3	3	6		
	Start→D	5	6	11		
Iteration2	Start→B	3	3	6	{B, D, C}	{S, A}
	Start→D	5	6	11		
	Start→A→C	6	5	11		
Iteration3	Start→B→D	7	6	13	{B, D, C}	{S, A}
	Start→A→C	6	5	11		
	Start→D	5	6	11		
Iteration4	~~Start→B→D~~	~~7~~	~~6~~	~~13~~	{B, D}	{S, A, C}
	Start→D	5	6	11		
	Start→A→C→Goal	8	0	8		

The minimal path will be = Start→A→C→Goal

The minimal cost will be = 8

The Search tree: