

Mid Semester Examination Spring 2020

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Course Title: Artificial Intelligence and Expert Systems

Semester: 1st

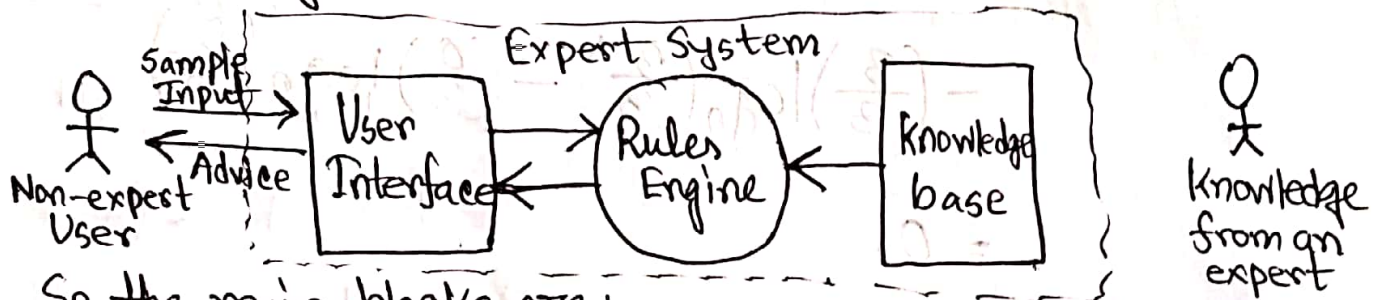
Year: 4th

Date: 28.08.20

"During Examination and upload time, I will not take any help from any other or any website or book. I will give my exam all by myself."

Answer to the question no: 1(a)

The main building blocks I will be needed in my expert system is given below-



So the main blocks are:

- i) Knowledge base (database)
- ii) interface ~~design~~ engine (explanation module)
- iii) User Interface (knowledge acquisition module)

Here,

Knowledge base is a repository of different facts that stores all knowledge about patients. User Interface is the most important part of expert system. It takes patient's query in a readable format. Rules ~~in~~ Engine is the brain of an expert system.

Answer to the question no: 1(b)

PEAS means Performance measure, Environment, Actuators, Sensors. In the given problem-

Agent: Hospital Sterilize Robot.

Performance measure: Sterilizing hospitals and other essential places perfectly, kill bacteria and viruses perfectly with help of ultraviolet light, give right command to hospital people, disinfect hospital rooms.

Environment: Patient, Hospital, Doctors and other staffs.

Actuators: Steering wheel, motors.

Sensors: Cameras, sonar, speed motor, ~~etc~~

Answer to the question no: 2(a)

The heuristic value of ^{start} S, A, B, C, D will be as follows:

$$h(S) = 0.7 \times 4 + 4 = 7$$

$$h(A) = 0.7 \times 7 + 3 = 7.9$$

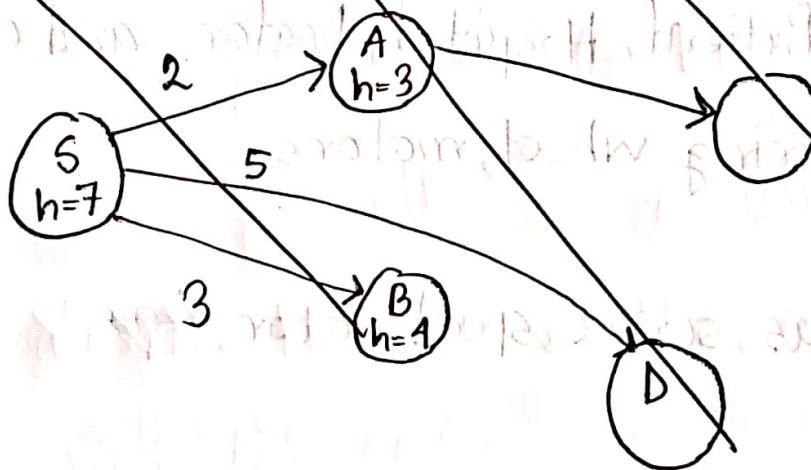
$$h(B) = 0.7 \times 5 + 2 = 5.5$$

$$h(C) = 0.7 \times 3 + 1 = 3.1$$

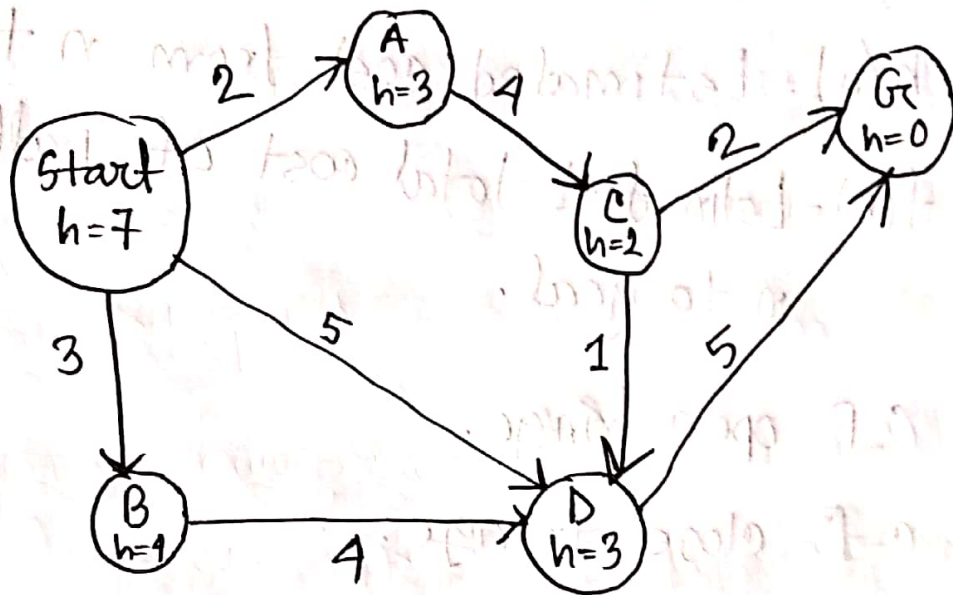
$$h(D) = 0.7 \times 6 + 2 = 6.2$$

$$h(G) = 0$$

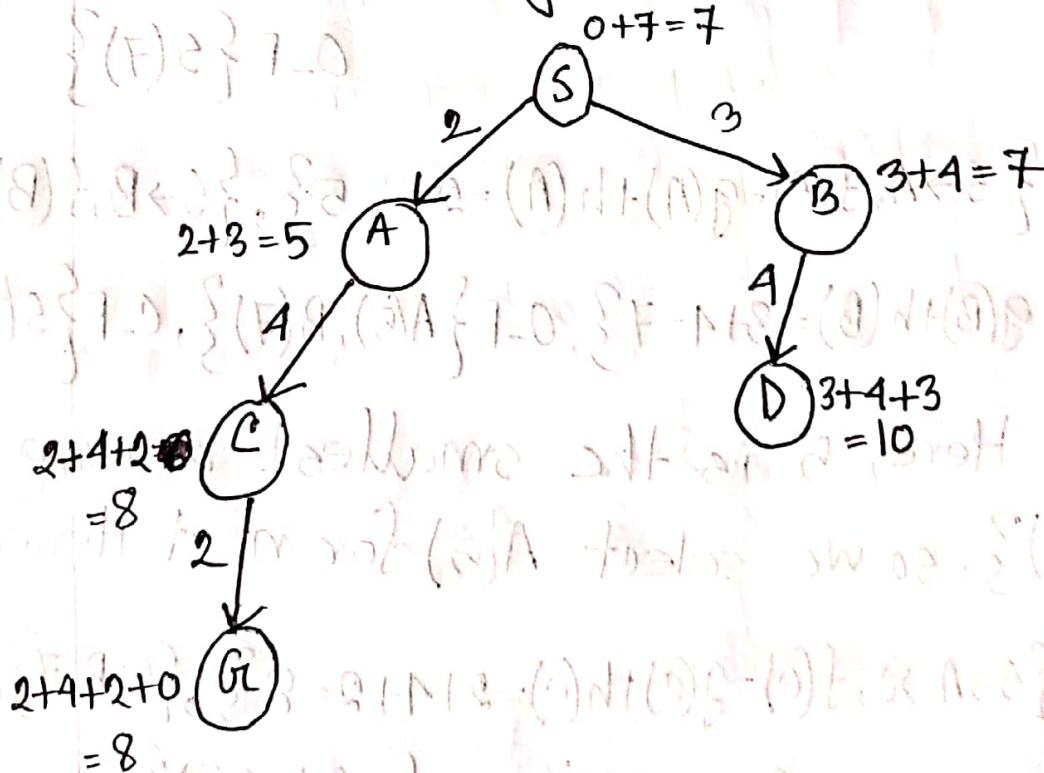
Now, the given state space graph:



Now, the given state graph:



The corresponding search tree:



Here, $g(n)$ = Actual cost to reach node n

$h(n)$ = Estimated cost from n to goal.

$f(n)$ = Estimated total cost of path through n to goal.

O-F = open fringe.

C-F = close fringe.

Initialization: $\{S, f(S) = g(S) + h(S) = 0 + 7 = 7\}$, C-F $\{\}$,
O-F $\{S(7)\}$

Iteration 1: $\{S \rightarrow A, f(A) = g(A) + h(A) = 2 + 3 = 5\}$, $\{S \rightarrow B, f(B) = g(B) + h(B) = 3 + 4 = 7\}$, O-F $\{A(5), B(7)\}$, C-F $\{S(7)\}$

Iteration 2: Here, 5 is the smallest among $\{A(5), B(7)\}$. so we select $A(5)$ for next iteration

Iteration 2: $\{S \rightarrow A \rightarrow C, f(C) = g(C) + h(C) = 2 + 4 + 2 = 8\}$, $\{S \rightarrow B, 7\}$,
C-F $\{S(7), A(5)\}$, O-F $\{B(7), C(8)\}$

Here, We select $B(7)$ for next iteration as $B(7)$ is the smallest among $\{B(7), C(8)\}$

Iteration 3: $\{S \rightarrow A \rightarrow C, 8\}, \{S \rightarrow B \rightarrow D, f(D) = g(D) + h(D) = 3 + 4 + 3 = 10\}, O-F\{S(7), A(5), B(7)\}, O-F\{C(8), D(10)\}$

Now, we select $C(8)$ for next iteration as $C(8)$ is the smallest among $\{C(8), D(10)\}$

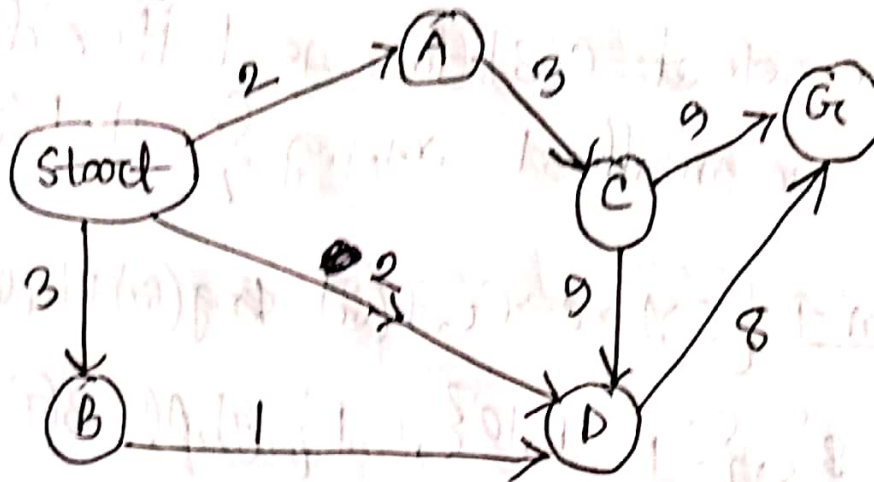
Iteration 4: $\{S \rightarrow A \rightarrow C \rightarrow G, f(G) = g(G) + h(G) = 2 + 4 + 2 + 0 = 8\}, \{S \rightarrow B \rightarrow D, 10\}, O-F\{S(7), A(5), B(7), C(8)\}, O-F\{D(10), G(8)\}$

Here, $G(8)$ is the smallest among $G(8)$ and $D(10)$. And we can see that the node 'G' is in the open fringe and it is the goal node in the given problem. So we have reached our goal node G with cost 8 which is optimal.

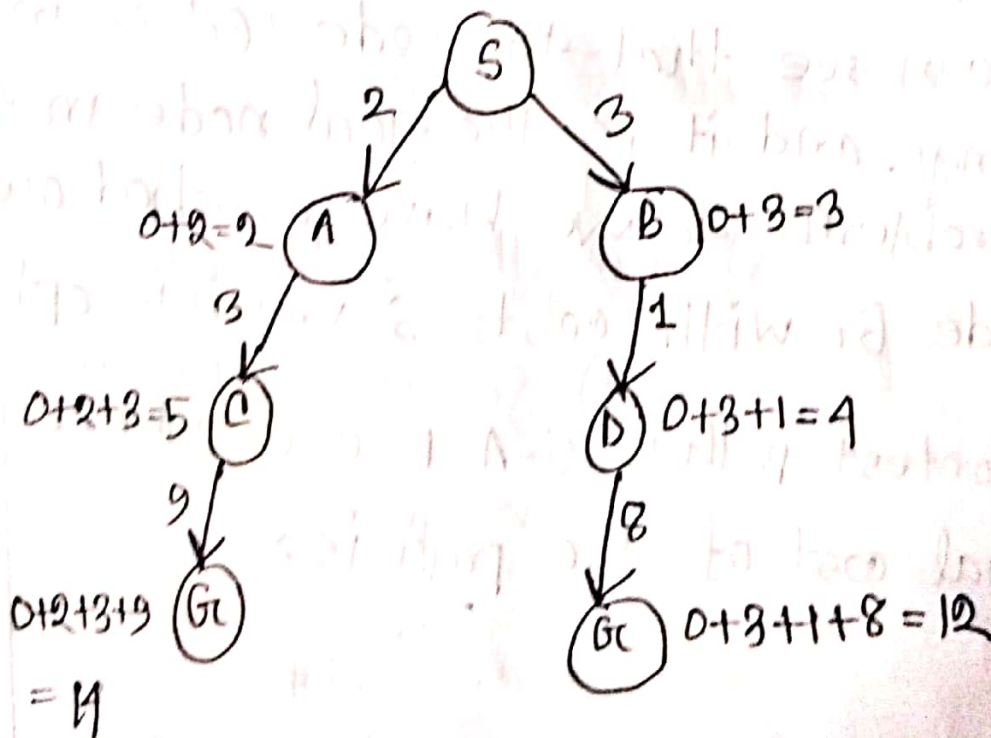
\therefore The shortest path is $S-A-B-C-G$ where the optimal cost of the path is 8.

Answer to the question no: 3(b)

My birthday - 23.03.1998



Corresponding search tree:



Initialization: $\{S, 0\}, C-F\{\}, O-F\{S\}$

Iteration 1: $\{S \rightarrow A, 0+2=2\}, \{S \rightarrow B=0+3=3\}, C-F\{S\},$
 $O-F\{A(2), B(3)\}$

We choose $A(2)$ as it is the smallest.

Iteration 2: $\{S \rightarrow A \rightarrow C, 0+2+3=5\}, \{S \rightarrow B=3\},$
 $C-F\{S(0), A(2)\}, O-F\{B(3), C(5)\}$

We choose $B(3)$ as it is the smallest among $B(3), C(5)$

Iteration 3: $\{S \rightarrow A \rightarrow C, 5\}, \{S \rightarrow B \rightarrow D, 0+3+1=4\},$
 $C-F\{S(0), A(2), B(3)\}, O-F\{C(5), D(4)\}$

We choose $D(4)$ as it is the smallest.

Iteration 4: $\{S \rightarrow A \rightarrow C, 5\}, \{S \rightarrow B \rightarrow D \rightarrow G, 0+3+1+8=12\},$
 $C-F\{S(0), A(2), B(3), D(4)\}, O-F\{C(5), G(12)\}$

We choose $C(5)$ as it is the smallest.

Iteration 5: $\{S \rightarrow A \rightarrow C \rightarrow G, 0+2+3+9=14\},$
 $\{S \rightarrow B \rightarrow D \rightarrow G, 12\}, C-F\{S(0), A(2), B(3), D(4), C(5)\},$
 $O-F\{G(12), G(14)\}$

Here, $G(12)$ is the smallest among $G(12)$ and $G(14)$, so $G(12)$ is selected.

And we can see that the node G is in the open fringe and it's the goal state in the given problem.

States Expanded $\rightarrow S-A-B-\overset{-c}{\underset{\wedge}{D}}-G$.

Path $\rightarrow S-B-D-G$ optimal cost 12.

Answer to the question no: 3(a)

Artificial Intelligence (AI) is different from machine learning (ML) and Deep learning (DL). I agree with that.

AI involves machines that can perform tasks that are characteristics of human intelligence.

(Machine learning) is a technique to achieve

AI and on the other hand Deep learning is one of many approaches to machine learning. ML provides a machine with the capability to learn from data & experience through algorithms. Deep learning does this learning through ways inspired by human brain.

