

[Total No. of Questions: 09]  
Uni. Roll No. ....

[Total No. of Pages: 3]

Program: B.Tech (CSE)  
Semester: 5<sup>th</sup>  
Name of Subject: Artificial Intelligence  
Subject Code: PCCS-108  
Paper ID: 16428

**Time Allowed: 02 Hours**

**Max. Marks: 60**

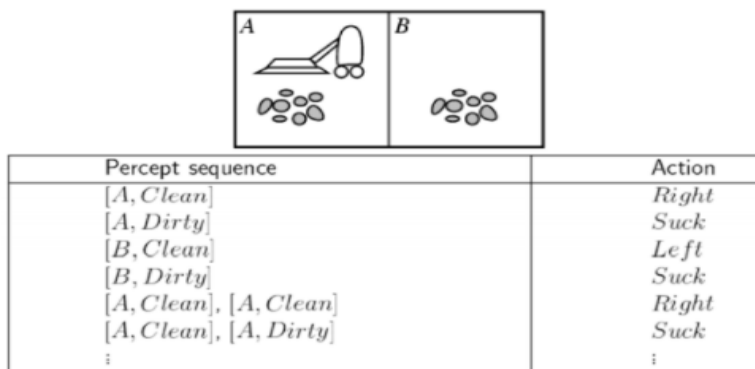
**NOTE:**

1. Each question is of 10 marks.
2. Attempt any six questions out of nine
3. Any missing data may be assumed appropriately

08-01-2022(E)

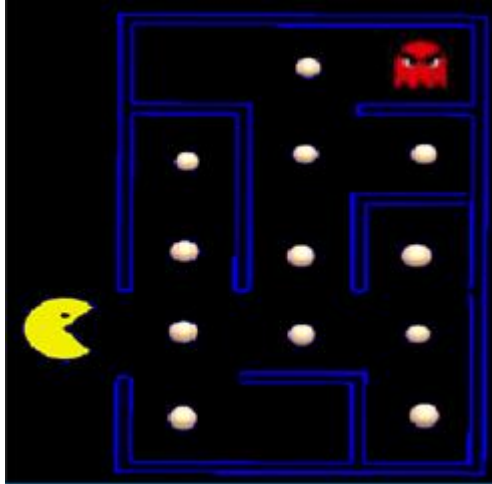
**1.**

- a. Show that the simple vacuum cleaner agent function defined in figure below is indeed rational.



- b. Consider the problem of driving a car from one place to another. Assume that the route is not known. Consider this as search problem with three operations:  
R1: Travel to next crossing and keep going straight, if possible.  
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Which control strategy is better: depth first or breadth first? Justify your answer.

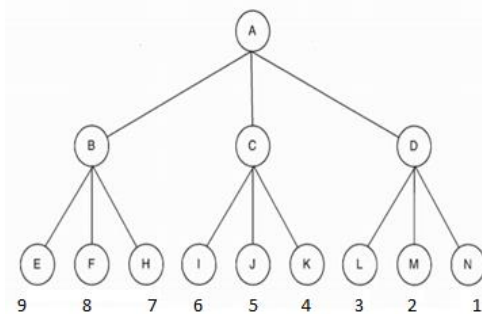
2. Consider the pacman maze given in the figure below. The pacman and the ghost have to move at every clock tick. The pacman can move in vertical as well as horizontal direction whereas the ghost can move only in horizontal direction. The ghost will be moving horizontally one step at every clock tick, changing the direction when it reaches the end. However the movement of the pacman is controlled by an intelligent system. When the pacman reaches a particular location, if that location has a dot it gets cleared and if the ghost is at same location then it loses the game. The goal is to clear all the 12 dots.



Solve the above problem using A\* algorithm by designing suitable heuristic function.

3.

- a. Justify how a static evaluation function can convert all judgments about board situation into a single overall quality number by quoting a suitable example
- b. For the following game tree which nodes do not need to be examined using alpha beta pruning?



4. Write down logical representations for the following sentences.
  - a. Horses, cows and pigs are mammals.
  - b. An offspring of horse is a horse.
  - c. Bluebird is a horse.
  - d. Bluebird is Charlie's parent.
  - e. Offspring and parent are inverse relation.
  - f. Every mammal has a parent.

Prove that "Charlie is a Horse." using

1. Backward chaining
2. Forward chaining
3. Resolution.

Also compare the above mentioned techniques.

5. **The spare tire problem:** Consider the problem of changing a flat tire. The initial state has a flat tire on the axle and a good spare tire in the trunk. The goal is to have a good spare tire properly mounted onto the car's axle. There are following actions: putting the car on jack, removing the spare from the trunk, removing the flat tire from the axle, putting the spare on the axle. Write a plan queue to solve the spare tire problem using goal stack method.
  
6. Compare linear, non-linear and partial order planning quoting suitable example of implementation of these planning techniques.
  
7.
  - a. How does AI handle reasoning under uncertainty? Explain with example.
  - b. Assume universe of discourse for set of salary structures(in terms of K) per month is defined as  $U = \{2,5,10,20,30,40,50,60,70,80\}$ .  
 The fuzzy sets defined on U based on salaries are  
 Poor =  $\{(2,1), (5,1), (10,0.8), (20,0.5), (30,0.2)\}$   
 Average =  $\{(10,0.2), (20,0.5), (30,0.6), (40,0.8), (50,0.6), (60,0.2)\}$   
 Rich =  $\{(40,0.2), (50,0.5), (60,0.8), (70,1), (80,1)\}$   
 Draw the graphs of all three fuzzy sets on the same co-ordinate axes.
  
8.
  - a. Take an example of 'a taxi agent'. How does it perform learning in an unsupervised environment?
  - b. Design perceptron for AND Boolean function.
  
9. List various components of natural language understanding process. Describe syntactic analysis and semantic analysis process in brief.

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