

Reg. No. : **E N G G T R E E . C O M**

**Question Paper Code : 30028**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Third Semester

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Artificial Intelligence and Data Science

AL 3391 — ARTIFICIAL INTELLIGENCE

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

- For each of the environments below determine what type of agent architecture is most appropriate (table lookup, simple reflex, goal-based or utility-based).
  - Medical Diagnosis System
  - Satellite Image Analysis System
  - Part Picking Robot
  - Interactive English Tutor
- Formulate PEAS for an automated taxi driver.
- Compare and Contrast Admissible and Consistent Heuristics.
- Comment on the statement "Breadth-first search is a special case of uniform-cost search".
- Class scheduling: There is a fixed number of professors and classrooms, a list of classes to be offered, and a list of possible time slots for classes. Each professor has a set of classes that he or she can teach. Give a precise formulation.
- Justify why we cannot use traditional min max for games with an element of chance, such as backgammon.
- If the unicorn is mythical, then it is immortal, but if it is not mythical, it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned. Prove: the unicorn is horned by resolution.

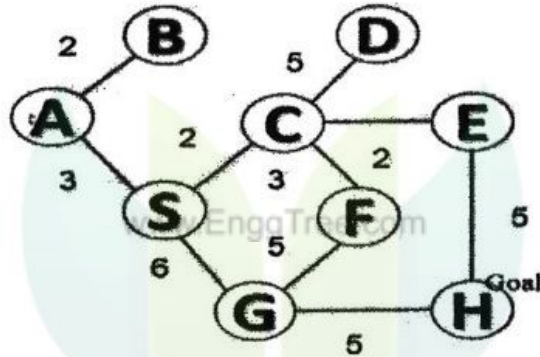
8. Some people like every vegetable. Convert it to First order Logic.
9. Justify the purpose of Bayesian networks.
10. What is Causal networks?

PART B — (5 × 13 = 65 marks)

11. (a) Consider the water jug problem: You are given two jugs, a 4-gallon one and 3-gallon one. Neither has any measuring marker on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallon of water from the 4-gallon jug? Explain the state space representation and apply an optimal sequence of actions to solve it.

Or

(b)



Perform BFS, DFS, Uniform cost search strategies on the following graph and also formulate the algorithm for any 2 strategies.

12. (a) Elaborate on the need for Local search algorithms and discuss any one algorithm in detail.

Or

- (b) Discuss on Online Search Agents that uses depth-first exploration.

13. (a) Brief on MinMax algorithm and also discuss the need for alpha beta pruning.

Or

- (b) Formulate the Map-coloring problem as CSP and explain with an example.

14. (a) (i) Brief on the concept of Resolution and explain the Propositional Resolution Algorithm. (5)
- (ii) Prove the following axioms using the Resolution Algorithm. (8)
- (1) All hounds howl at night.
  - (2) Anyone who has any cats will not have any mice.
  - (3) Light sleepers do not have anything which howls at night.
  - (4) John has either a cat or a hound.
  - (5) (Conclusion) If John is a light sleeper, then John does not have any mice.

Or

- (b) Give the rules of inferences in Propositional Logic. (8)
- Which rule of inference is used in each argument below? (5)
- (i) Alice is a Math major. Therefore, Alice is either a Math major or a CSI major.
  - (ii) Jerry is a Math major and a CSI major. Therefore, Jerry is a Math major.
  - (iii) If it is rainy, then the pool will be closed. It is rainy. Therefore, the pool is closed.
  - (iv) If it snows today, the university will close. The university is not closed today. Therefore, it did not snow today.
  - (v) If I go swimming, then I will stay in the sun too long. If I stay in the sun too long, then I will sunburn. Therefore, if I go swimming, then I will sunburn.
15. (a) Design a Bayesian belief network for the diagnosis of car's electrical system.

Or

- (b) Briefly explain exact inference in Bayesian Networks.

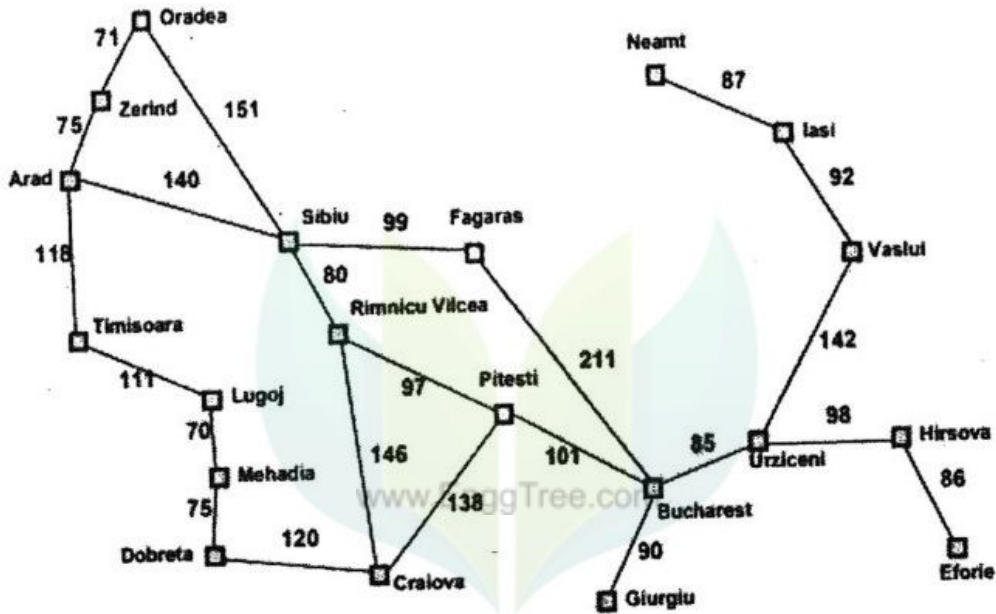
PART C — (1 × 15 = 15 marks)

16. (a) The missionaries and cannibals problem is usually stated as follows. Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.
- (i) Formulate the problem precisely, making only those distinctions necessary to ensure a valid solution. Draw a diagram of the complete state space. (5)

- (ii) Implement and solve the problem optimally using an appropriate search algorithm. Is it a good idea to check for repeated states? (8)
- (iii) Why do you think people have a hard time solving this puzzle, given that the state space is so simple? (2)

Or

- (b) Trace A\* Algorithm to find the shortest route from Lugoj to Bucharest using the straight line distance heuristic for the below diagram and the straight line distance given in the table. Also elaborate on A\* algorithm.



Town	Air Dist.	Town	Air Dist.
Arad	366	Mehadia	241
Bucharest	0	Neamt	234
Craiova	160	Oradea	380
Dobreta	242	Pitesti	100
Eforie	161	Rimnicu Vilcea	193
Fagaras	176	Sibiu	253
Giurgiu	77	Timisoara	329
Hirsova	151	Urziceni	80
Lasi	226	Vaslui	199
Lugoj	244	Zerind	374