U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 20CS5PCAIP **Max Marks: 100**
Course: Artificial Intelligence

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

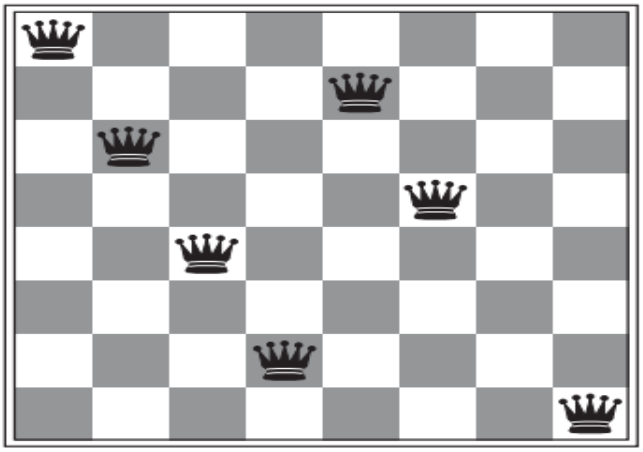
1 a) Write the PEAS representation for Automated Car driver **4**

b) Differentiate between: **6**
i) Deterministic vs Stochastic
ii) Discrete vs Continuous
iii) Episodic vs Sequential

c) Give the complete problem formulation for the following cases. Choose a formulation that is precise enough to be implemented. **10**
i) You have 3 jugs, measuring 12 gallons, 8 gallons, and 3 gallons, and a water faucet/tap. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one gallon.
ii) A 3-foot-tall monkey is in a room where some bananas are suspended from the 8-foot ceiling. He would like to get the bananas. The room contains 2 stackable, movable, climbable 3-foot-high crates/wooden cases.

OR

2 a) Illustrate 2 main kinds of formulation for 8 Queens problem. Discuss the incremental formulation for the given instance shown in figure. **8**



b) With a neat diagram and algorithm discuss the model that keeps track of the current state of the world. **8**

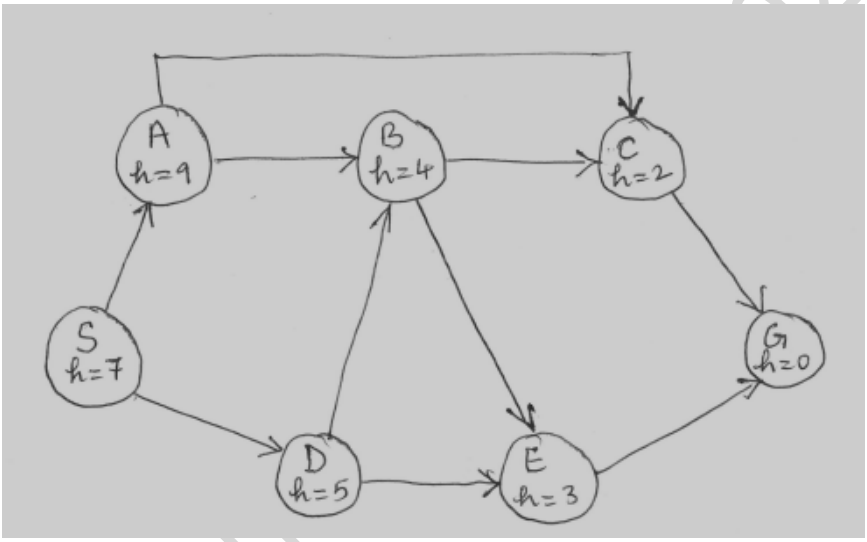
c) For each of the following activities give a PEAS description of task environment and characteristic in terms of their properties. **4**

i) Playing soccer

ii) Brushing your teeth

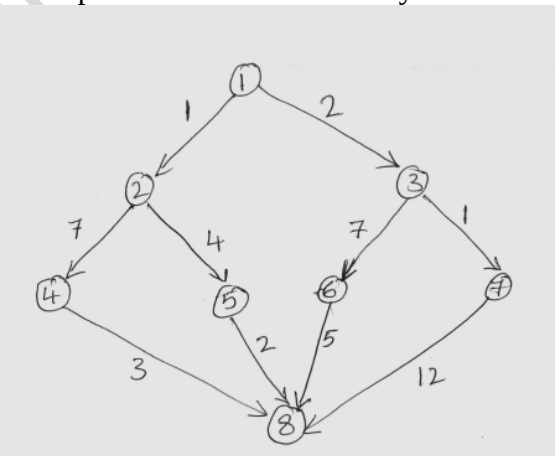
UNIT - II

3 a) Using the network given below Identify the path from the initial to the goal state applying greedy Best First search. The heuristic values h of each node is given below the name of the node. Node S is initial state and node G is goal state. Mention the drawback. **6**



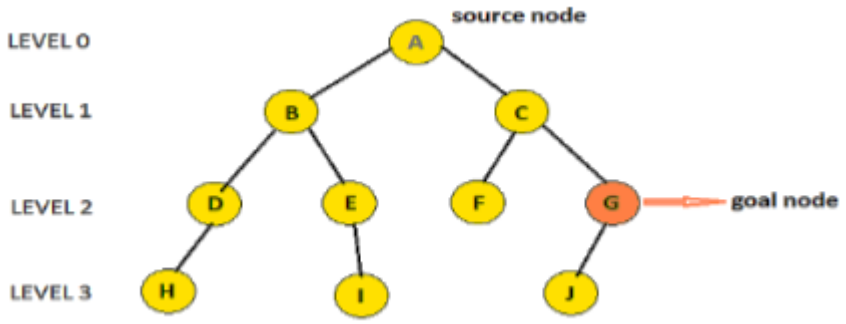
b) Compare the evaluation functions used by Greedy BFS, Uniform Cost Search and A* algorithm in order to choose the optimal path from the source to the goal node. **7**

Using the tree given below which depicts the scenario of the travelling salesperson starts from city 1 and should reach city 8. The values on edges represent the cost of reaching form one city to another. Apply A*algorithm to write the steps to reach the goal node and find the final cost. Use heuristic value provided in Table suitably



Node	H(n)
1	10
2	5
3	6
4	4
5	15
6	5
7	8
8	0

c) Write the iterative deepening depth first search algorithm and outline the iterations performed to reach the goal state shown in the below figure. **7**



Tree, node A is source node and node G is goal node

UNIT - III

4 a) Write and explain the simple resolution algorithm for Propositional Logic. **10**

b) Explain the DPLL algorithm for checking the satisfiability of a sentence in propositional logic. Justify the improvements over the scheme of TT Entails. **10**

OR

5 a) Write the Quantifiers using FOL for the following **4**

i) Only one student failed in Science

ii) All students take both Mathematics and Science

b) Consider the following axioms: **8**

All hounds howl at night.
Anyone who has any cats will not have any mice.
Light sleepers do not have anything which howls at night.
John has either a cat or a hound.
The clauses written for the above axioms are shown below, using LS(x) for `light sleeper'.

$\forall$ x (HOUND(x) $\rightarrow$ HOWL(x))
$\forall$ x $\forall$ y (HAVE (x,y) $\wedge$ CAT (y) $\rightarrow$ $\neg$ $\exists$ z (HAVE(x,z) $\wedge$ MOUSE (z)))
$\forall$ x (LS(x) $\rightarrow$ $\neg$ $\exists$ y (HAVE (x,y) $\wedge$ HOWL(y)))
$\exists$ x (HAVE (John,x) $\wedge$ (CAT(x) $\vee$ HOUND(x)))
LS(John) $\rightarrow$ $\neg$ $\exists$ z (HAVE(John,z) $\wedge$ MOUSE(z))

Prove by Resolution "**If John is a light sleeper, then John does not have any mice**".

c) Illustrate the generic knowledge-based agent using operations TELL, ASK, ACTIONS. **8**

UNIT - IV

6 a) Consider the following Knowledege Base(KB) **10**

i) The Humidity is high or sky is cloudy

ii) If sky is cloudy, then it will rain.

iii) If the humidity is high, then it is hot.

iv) It is not hot.

Goal: It will rain.
Use Propositional Logic and apply resolution methods to prove that the goal is derivable from given KB.

b) Write and explain the Unification Algorithm. **10**

UNIT - V

7 a) We have a bag of three biased coins a, b, and c with probabilities of coming up heads of 20%, 60%, and 80%, respectively. One coin is drawn randomly from the bag (with equal likelihood of drawing each of the three coins), and then the coin is flipped three times to generate the outcomes x1, x2, and x3. **10**

i) Draw the bayesian network corresponding to this setup and define the necessary CPT's.

ii) Calculate which coin was most likely to have been drawn from the bag if the observed flips come out heads twice and tails once. Justify your answer.

b) Given the full joint distribution as shown in table below, calculate the following: **10**

a. P(Toothache

b. P(Cavity)

c. P(Toothache | Cavity)

d. P(Cavity | Toothache ∨ Catch)

	toothache		*¬toothache*	
	catch	*¬catch*	*catch*	*¬catch*
cavity	0.108	0.012	0.072	0.008
¬cavity	0.016	0.064	0.144	0.576

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