KATHMANDU UNIVERSITY
End-Semester Examination
August, 2018

Marks scored:

Level : B.Sc.
Year : IV

Course : COMP 472
Semester: I

Exam Roll No. :

Time: 30 mins.

F.M. : 10

Registration No.:

Date : AUG 15 2018

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Pick the correct answer(s)

1. The A* algorithm used the heuristic function is actually based on
   [ ] Breadth-First-Search [ ] Depth-First-Search
   [ ] Best-First-Search [ ] Hill climbing.

2. The action of the Simple reflex agent completely depends upon
   [ ] Perception history [ ] Current perception
   [ ] Learning theory [ ] Utility functions

3. A search algorithm is *complete* if it
   [ ] always finds the optimal solution [ ] always finds a solution if there is one
   [ ] finds all possible solutions [ ] never finds a solution

4. Which of the following is a problem that occurs in hill climbing?
   [ ] Cliff [ ] Ridge [ ] Valley [ ] Rock slide

5. A greedy search uses a heuristic function to
   [ ] expand the node that appears to be closest to the goal
   [ ] expand the node that is closest to the goal
   [ ] expand the node that is the most expensive
   [ ] expand the leftmost node

6. Which one of the following statement is true regarding the Learning agent?
   [ ] The performance element is responsible for selecting the external action.
   [ ] The learning element is responsible for selecting the external action.
   [ ] The performance element takes the feedback from the critic.
   [ ] The performance element is responsible for suggesting actions that will lead to new experiences.

7. An utility function is used in game playing to
   [ ] estimate the expected utility of the game from a given position
   [ ] compute the winner of the game based on number of pieces left
   [ ] compute the utility of a terminal leaf in a game tree
   [ ] compute the best move for the successor function

8. While defining the Artificial intelligence system "laws of thought" is defined under the concept of_____.
   [ ] Thinking Humanly [ ] Acting Humanly
   [ ] Thinking Rationally [ ] Acting Rationally

9. The model $[(P \Rightarrow Q) \Rightarrow [(R \vee P) \Rightarrow (R \vee Q)]$ in the system is _____ where the P,Q,R are the propositions.
   [ ] valid [ ] satisfiable [ ] unsatisfiable [ ] invalid

10. The equivalent conversion of the sentence $(\forall x)\ \neg P(x)$ is _____
[ ] $\neg(\exists x)\ P(x)$ [ ] $(\exists x)\ \neg P(x)$ [ ] $\neg\ (\exists x)\ \neg P(x)$ [ ] $\neg(\forall x)\ \neg P(x)$

11. You can fool some of the people all of the time can be translated as _____ in FOPL
[ ] $\exists x\ \forall t$ person(x) $\wedge$ time(t) $\rightarrow$ can-fool(x, t)
[ ] $\forall x\ \exists t$ (person(x) $\rightarrow$ time(t) $\wedge$can-fool(x, t))
[ ] $\forall x$ (person(x) $\rightarrow\ \exists t$ (time(t) $\wedge$can-fool(x, t))
[ ] $\forall x\ \exists y$ (person(x) $\rightarrow$ time(t) $\wedge$can-fool(x, t,y))

12. The conference that launched the AI revolution in 1956 was held at:
[ ] Dartmouth [ ] Harvard [ ] New York [ ] Stanford

13. The inference rule _____validates the inference from P implies Q and the contradictory of to the Q contradictory of P.
[ ] modus ponens [ ] modus tollens
[ ] unit resolution [ ] resolution refutation

14. Which one of the following agent knows the actual outcome of its actions and can act accordingly?
[ ] rational [ ] omniscience [ ] autonomous [ ] irrational

15. The model $[(p \wedge (q \Rightarrow r)) \Leftrightarrow ((\neg p \vee q) \Rightarrow (p \wedge r))]$in the system is _____ where the P,Q,R are the propositions.
[ ] valid [ ] unsatisfiable [ ] satisfiable [ ] invalid

16. Which one of the following algorithm escapes local maxima and is complete and optimal given a "long enough" cooling schedule.
[ ] hill climbing [ ] simulated annealing
[ ] genetic algorithm [ ] online search

17. The space complexity of Iterative Deepening Search is represented as ('b' indicates the branching factor, 'd' indicates the depth of the goal state)
[ ] $O(^{bd/2})$ [ ] $O(b^d)$ [ ] O(bd) [ ] $O(b^{d+1})$

18. For a chess chess playing agent with a clock the environment defined is
[ ] Fully observable, Discrete, strategic
[ ] Partially observable, continuous, strategic
[ ] Fully observable, continuous, deterministic
[ ] Partially observable, Discrete, deterministic

19. Which one of the following agent type does not care about the evolution of the surrounding world?
[ ] Simple reflex agent [ ] Model based reflex agent
[ ] Goal based agent [ ] Utility based agent

20. Which of the following is the valid conjunctive normal form for the problem (-P V(Q $\wedge$ -R))VS ?
[ ] (SV-PVQ) $\wedge$(SV-PV-R) [ ] (SV-P$\wedge$Q) V (SV-P$\wedge$-R)
[ ] (SV-P) V(PV-R) [ ] (SV-P)V(SVQ) $\wedge$(-PV-R)

KATHMANDU UNIVERSITY
End Semester Examination
August, 2018

AUG 1 5 2018

Level : B.Sc.
Year : IV
Time : 2 hrs. 30 mins.

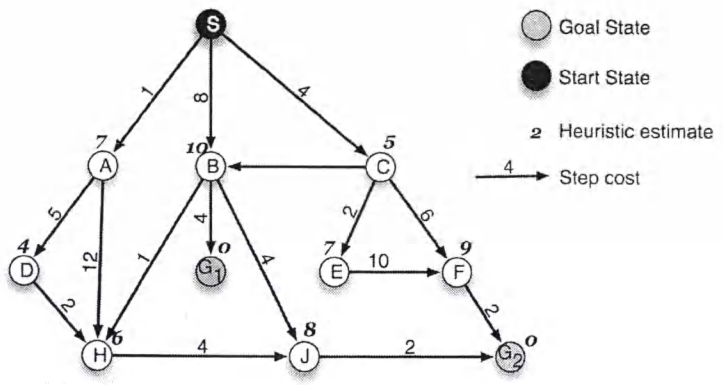
Course : COMP 472
Semester: I
F.M. : 40

SECTION "B"
[2 Q. × 8 = 16 marks]

Attempt ***ANY TWO*** questions.

1. Describe PEAS for Internet shopping agent. Explain which model architecture you would prefer in order to design Internet shopping agent.

2. Consider the search space below, where S is the start node and G1 and G2 are goal nodes. Arcs are labeled with the value of a *cost function*; the number gives the cost of traversing the arc. Above each node is the value of a *heuristic function*; the number gives the estimate of the distance to the goal. Assume that uninformed search algorithms always choose the left branch first when there is a choice. Assume that the algorithms do *not* keep track of and recognize repeated states.
For each of the following search strategies,
(a) Indicate which goal state is reached first (if any) and
(b) List *in order,* all the states that are popped off the OPEN list.



a. Depth-first
b. Iterative Deepening
c. Breadth-first

3. Define the term admissible heuristics. Discuss the different variation of hill climbing search algorithm with examples. [2+6]

SECTION "C"
[6 Q.×4=24 marks]

Attempt ***ANY SIX*** questions.

4. As you know that a dolphin is said to be intelligent. Even dogs are intelligent. There are different other animals which are intelligent. Some of the examples such as MYCIN, MARSOVER are also said to be intelligent in their domain. Then how can a Human only claim that s/he is intelligent? Don't you think Human is biasing other animal or system while they define intelligence?

5. Explain the different characteristics that a computer should possess in order to pass the Turing Test.

6. Translate the following sentences (a-d) into FOPL.
   a. All people who are not poor and are smart are happy.
   b. Those people who read are not stupid
   c. John can read and is wealthy
   d. Happy people have exciting lives

7. Discuss the typical neural network architecture. Explain how it is different from conventional computing.

8. What do you understand by Knowledge Base? How can you represent it in computer tractable form?

9. Convert the following expressions into CNF form.
   a. $((P \wedge Q) \vee (R \wedge S)) \vee (\neg Q \wedge (P \vee T))$
   b. $P \Rightarrow ((Q \Rightarrow R) \vee \neg S)$

10. You are asked to replace each letter by a different digit from 0 to 9. When each letter is replaced by the appropriate number, this cryptogram represents a correct addition Problem:

    HERE+SHE=COMES

    List the variables, their domains, and the constraints. You should explain each step.