KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Mark Scored:

Level : B.E./B.Sc.
Year : IV

Course : COMP 472
Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date 06 MAR 2019

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose and mark [X] in the box with most appropriate answer.

1. Which one of the following symbol is not the basic syntactic elements of the first order logic?
   [ ] Connection symbols [ ] Constant symbols
   [ ] Predicate symbols [ ] Function symbols

2. "There is no one who does not like ice-cream" can be represented in FOPL as:
   [ ] $\forall x$ likes(x, Ice-cream) [ ] $-\forall x$ -likes(x, Ice-cream)
   [ ] $\exists x$- likes(x, Ice-cream) [ ] $\forall x \exists x$(x, Ice-cream)

3. The ontological commitment of the propositional logic is _____
   [ ] facts only [ ] facts and objects
   [ ] facts and relations [ ] facts, objects and relations

4. The sentence model "$(p \wedge (q \Rightarrow r)) \Leftrightarrow ((\neg p \vee q) \Rightarrow (p \wedge r))$" can be viewed as _____
   [ ] satisfiable [ ] unsatisfiable [ ] valid [ ] illegal

5. In a sentence model where P→Q , –Q exists then we can infer the knowledge –P as a conclusion can be defined by:
   [ ] Modus Tollens [ ] Modus Ponens [ ] Contraposition [ ] Unit Resolution

6. The Turing test approach defines the machine's intelligence with respect to _____
   [ ] machine that act like human [ ] machine that thinks like human
   [ ] machine that thinks rationally [ ] machine that act rationally

7. In the general model learning agents the _____ element is responsible for making improvement.
   [ ] Performance element [ ] Learning element
   [ ] Critics [ ] Problem Generator

8. The "chess playing agent with a clock" can be viewed as an agent playing on_____ environment.
   [ ] fully observable, deterministic but static
   [ ] fully observable, strategic but semi static
   [ ] partially observable, strategic but static
   [ ] partially observable, deterministic but semi static

9. The corresponding translation of the sentence "Either Jack or Curiosity killed the cat, who is named Tuna." Can be represented in FOPL as:
   [ ] $\forall x$ (Kills(Jack,Tuna) $\vee$ Kills(Curiosity,Tuna))
   [ ] Kills(Jack,Tuna) $\vee$ Kills(Curiosity,Tuna)
   [ ] $\exists x$ (Kills(Jack,Tuna)→ Kills(Curiosity,Tuna))
   [ ] Kills(Jack,Tuna) →Kills(Curiosity,Tuna)

10. The term "Entailment" is widely used in the knowledge base and is defined as:
[ ] deriving sentences from other sentences
[ ] necessary truth of one sentence given another
[ ] derivations produce only entailed sentences
[ ] truth of sentences with respect to models

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

12. 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

13. The FOPL translation of the sentence "Someone at KU is smart" is _____
[ ] $\exists x$ At(x, KU) $\wedge$ Smart(x) [ ] $\exists x$ At(x, KU) $\Rightarrow$ Smart(x)
[ ] $\forall x$ At(x, KU) $\wedge$ Smart(x) [ ] $\forall x \exists x$ At(x, KU) $\vee$ Smart(x)

14. Genetic algorithm has a wide applicability in the problem solving method through searching and uses the concept of _____
[ ] Hill climbing search [ ] A*search
[ ] Uniform cost search [ ] Neural search

15. Which AI system reasons through problems and offer advice in the form of a conclusion or recommendation?
[ ] Expert systems [ ] Neural networks
[ ] Genetic algorithms [ ] Intelligent agents

16. _____ expands the shallowest node in the search tree first. It is complete, optimal for unit-cost operators, and has time and space complexity of $O(b^d)$. The space complexity makes it impractical in most cases.
[ ] Breadth-first search [ ] Uniform-cost search
[ ] Depth-first search [ ] Depth-limited search

17. An algorithm A is admissible if, _____
[ ] it is not guaranteed to return an optimal solution when one exists
[ ] it is guaranteed to return an optimal solution when one exists
[ ] it returns more solutions, but not an optimal one
[ ] it guarantees to return more optimal solutions

18. While solving the crypto arithmetic puzzle for (SEND+MORE=MONEY) the acceptable value for the R and E is:
[ ] 5 and 7 [ ] 8 and 5 [ ] 7 and 5 [ ] 5 and 8

19. Mark the TRUE statement.
[ ] Time complexity of BFS is exponential and DFS is linear
[ ] Time and Space complexity of BFS and DFS is Linear.
[ ] Time and Space complexity of BFS and DFS is exponential.
[ ] Space complexity of BFS is exponential and DFS is linear

20. Which one of the following definition of AI is cognitive modeling approach?
[ ] Acting Humanly [ ] Thinking Humanly
[ ] Thinking Rationally [ ] Acting Rationally

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F. M. : 40

SECTION "B"
[2Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

1. What do you mean by well-defined problems? Consider that you have three jugs, measuring 12 gallons, 8 gallons, 3 gallons and a water faucet and neither of the jugs have measuring marks. You can fill the jugs up or empty them out from one to another or onto the ground. Your task is to represent all the state space and find exactly one gallons of water one 12 gallons of jug. Show each scratch of your work.

2. Discuss the population representation, cross over point, crossover rate, selection criteria, fitness function, mutation rate, solution to some generation, and optimization criteria for the popular **eight queen's problem.**

3. The police have three suspects for the murder of **Jenith**: **Smith**, **Jones**, and **Williams**. Smith, Jones, and Williams each declare that they did not kill Jenith. Smith also states that Jenith was a friend of Jones and that Williams disliked him. Jones also states that he did not know Jenith and that he was out of town the day Jenith was killed. Williams also states that he saw both Smith and Jones with Jenith the day of the killing and that either Smith or Jones must have killed him.

   Depending upon the above scenario, use Propositional logic to determine who the murderer was if one of the three men is guilty, the two innocent men are telling the truth, but the statements of the guilty man may or may not be true?

SECTION "C"
[6Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

4. Describe the PEAS and details of the Environment for the Refinery Controller Agent works.

5. How do you define Intelligence? Write a structure for the model based reflex agents program.

6. What do you mean by admissible heuristics? Prove that If *an* admissible is chosen then, A^* using TREE-SEARCH is always optimal.

7. Alan Turing's work to define the machine's intelligence was a milestone in AI history. Explain in details how Alan claims that the machine is intelligent and write a critical analysis on this claim.

8. Define Perceptron model. Explain in detail how this perceptron learn its classification tasks?

9. The heuristics path algorithm is a best-first search in which the objective function is given as:
$f(n) = (2 - w)g(n) + wh(n)$. Analyze the function and state for what value of w is this algorithm guaranteed to be optimal?

10. Using resolution refutation write down your conclusion whether **whales falls under mammal's family or Pisces family**.
    a. That animal which does not live in land but can swim falls under the Pisces family.
    b. Some animals lay eggs and are mammals while some give directly birth to baby and are mammals.
    c. Whales live in water but gives direct birth to baby claves.
    d. Mammals live in land.