



Addis Ababa University

College of Natural and Computational Sciences

Department of Computer Science

FINAL EXAMINATION (50%)

Introduction to Artificial Intelligence [CoSc3081]

Time Allotted: 2 Hrs.

Instructor: Samuel G.

Date of Exam: June 13, 2022

NAME

ID No.

Instructions

- ✦ Make sure that the question paper consists of **9 pages** including this cover page.
- ✦ Read the instructions and the questions carefully.
- ✦ Answer all questions eligibly on the spaces provided.
- ✦ A wrong answer that has nothing to do with the question or one that contradicts established facts or theories will lead to mark deductions.
- ✦ Any kind of attempt to copy answer of other student or **cheat** will **nullify** both parties.

For Instructor's Use Only

Part	Part I (15%)	Part II (5%)	Part III (20%)	Part IV (10%)	Total (50%)
Marks					

Good Luck!!!

Part I. Choose the best answer from the given alternatives. (Each 1 Mark)

_____ 1. What is the logical translation of the following statement?

"None of my friends are perfect."

(A) $\exists x(F(x) \wedge \neg P(x))$

(B) $\exists x(\neg F(x) \wedge P(x))$

(C) $\exists x(\neg F(x) \wedge \neg P(x))$

(D) $\neg \exists x(F(x) \wedge P(x))$

_____ 2. Suppose the predicate $F(x, y, t)$ is used to represent the statement that person x can fool person y at time t , which one of the statements below expresses best the meaning of the formula $\forall x \exists y \exists t (\neg F(x, y, t))$?

- A. Everyone can fool some person at some time
- B. Everyone cannot fool some person all the time
- C. No one can fool some person at some time
- D. No one can fool everyone all the time
- E. All of the Above

_____ 3. Consider the given prolog program

book(1,title1,author1).

book(2,title2,author1).

book(3,title3,author2).

book(4,title4,author3).

What will be the correct query to find the book(s) belong to author1.

A. book(_,X,author1).

D. All of the Above

B. book(1,X,author1).

E. None of the Above

C. book(1,_,author1).

_____ 4. SWI- prolog program can be loaded by typing the command.

A. load

D. reconstruct

B. consult

E. None of the Above

C. file

_____ 5. The statement, "Every comedian is funny" where $C(x)$ is "x is a comedian" and $F(x)$ is "x is funny" and the domain consists of all people.

A. $\exists x(C(x) \wedge F(x))$

B. $\forall x(C(x) \wedge F(x))$

C. $\exists x(C(x) \rightarrow F(x))$

D. $\forall x(C(x) \rightarrow F(x))$

E. All of the Above

F. None of the Above

_____ 6. Which of the following are logically equivalent?

I. $\neg \forall x (P(x))$

II. $\neg \exists x (P(x))$

III. $\neg \exists x (\neg P(x))$

IV. $\exists x (\neg P(x))$

A. I and III

D. II and IV

B. I and IV

E. None of the Above

C. II and III

_____ 7. In artificial Intelligence, knowledge can be represented as _____.

i. Predicate Logic

ii. Propositional Logic

iii. Machine Logic

iv. Computational Logic

A. Only II

D. Only IV

B. Both I and II

E. None of the Above

C. Both II and III

_____ 8. In propositional Logic, which statement is not correct?

A. Each sentence is a declarative sentence.

B. Propositional logic is not a fully-fledged concept to represent real world problems.

C. The sentences of propositional logic can have answers other than True or False.

D. Propositional logic is a knowledge representation technique in AI.

E. None of the above

_____ 9. What will take place as the agent observes its interactions with the world?

A. Speech

B. Hearing

C. Perceiving

D. Learning

E. All of the Above

- _____ 10. Automated vehicle is an example of _____
- A. Unsupervised learning
 - B. Active learning
 - C. Reinforcement learning
 - D. Supervised learning
 - E. None of the Above
- _____ 11. Among the following which of the following is true?
- (i) On average, neural networks have higher computational rates than conventional computers.
 - (ii) Neural networks learn by examples.
 - (iii) Neural networks mimic the way the human brain works.
- A. (ii) and (iii) are true
 - B. (i) and (iii) are true
 - C. (i) and (ii) are true
 - D. All of the mentioned are true
 - E. None of the mentioned
- _____ 12. Which one is the main challenge/s of NLP?
- A. Handling Tokenization
 - B. Handling Ambiguity of Sentences
 - C. Handling POS-Tagging
 - D. Handling Semantics of Sentences
 - E. All of the mentioned
- _____ 13. Which of the following is also called as exploratory learning?
- A. Active learning
 - B. Unsupervised learning
 - C. Supervised learning
 - D. Reinforcement learning
 - E. None of the Above
- _____ 14. Parts-of-Speech tagging determines _____
- A. part-of-speech for each word dynamically as per meaning of the sentence
 - B. part-of-speech for each word dynamically as per sentence structure
 - C. all part-of-speech for a specific word given as input
 - D. All of the mentioned
- _____ 15. Which of the following is not the promise of artificial neural network?
- A. It can explain result
 - B. It can survive the failure of some nodes
 - C. It has inherent parallelism
 - D. It can handle noise
 - E. None of the Above

Part II: Say **True** if the statement is correct and **false** if it is incorrect. (Each 1 Mark)

- _____ 1. An expert system is a computer program that contains some of the subject-specific knowledge of one or more human experts.
- _____ 2. A logical formula is considered to be in Disjunctive Normal Form (DNF) if and only if it is a disjunction of one or more conjunctions of one or more literals.
- _____ 3. Expert systems work independently, carrying out specific, repetitive, or predictable tasks.
- _____ 4. Natural Language Generation is concerned with mapping the given input in the natural language into a useful representation.
- _____ 5. A knowledge-based agent can combine general knowledge with current percepts to infer hidden aspects of the current state prior to selecting actions.

Part III: Write the brief description for the answer of each question as required.

Propositional logic

1. Given the following seven sentences **1 up to 7**, translate the sentences from A) to D) to propositional logic in the space provided next to each sentence. **(4 marks)**

P: Abebe is too greedy
Q: Abebe will pass the exam
R: There is exam today
S: Maths is an easy subject
T: Kebede sits for the exam
U: Kebede like Math
V: Abebe Likes Math

A. Abebe likes maths but he is too greedy

B. Although maths is easy, Kebede does not like maths so he will not sit for the exam

C. If math is an easy subject then Abebe will pass the exam

D. If there is exam today then Kebede sits for the exam

2. Let

P= "Natan is healthy"

Q= "Natan is wealthy"

R= " Natan is wise"

Represent: **Each 0.5 Mark**

- a. Natan is healthy and wealthy but not wise: _____
- b. Natan is not wealthy but he is healthy and wise: _____
- c. Natan is neither healthy nor wealthy nor wise: _____
- d. Either Natan Wealthy or healthy: _____
- e. If Natan is wise then he is wealthy _____

_____ 16. Convert the following to Conjunctive Normal Form (CNF) the formula. (Each 1.5 Marks)

I. $\neg (\neg p \vee q) \vee (r \rightarrow \neg s)$

II. $(\neg p \rightarrow q) \rightarrow (q \rightarrow \neg r)$

Predicate logic

3. Translate the sentences in quantified expressions of predicate logic, write down the negated expression and then translate the negated expression in English. The predicates to be used are given in parentheses. (Each 1.5 Marks)

I. Some problems are difficult. (problem(x), difficult(x))

First Order Logic:

II. All students that study discrete math are good at logic.
(student(x), study_discrete_math(x), good_at_logic(x))

First Order Logic:

III. No students are allowed to carry guns. (student(x), carry_gun(x))

First Order Logic:

4. For each of the following **First Order Logic** write the corresponding **English sentence**. (Each 1.5 Marks)

A. $\forall x (\text{Mountain}(X)) \rightarrow \neg \text{Higher}(x, x)$

B. $\forall x (\text{student}(X) \rightarrow ((\text{walk}(X) \rightarrow \text{talk}(X))))$

C. $\exists x (\text{Dog}(x) \wedge \forall y (\text{Cat}(y) \rightarrow \text{Larger}(x, y)))$

D. $\forall x ((\text{Dog}(x) \wedge \forall y (\text{Cat}(y) \rightarrow \text{Larger}(x, y))) \rightarrow \text{Loves}(\text{Abel}, x))$

Part IV: Essay Type Questions. Based on the question answer the following questions.

1. Briefly describe the difference between Predicate and Propositional Logic with example? (2 Marks)

2. By using the concept of Natural Language processing what are the steps you will follow to develop systems such as (Search Engine, Speech Recognition, Question Answering and others) for the local languages used in our country? What will be the challenges you will face while developing applications? Explain your answer with example. (3 Marks)

3. Explain the unique characteristics of Artificial Neural Network for machine learning?
How it works? (2 Marks)

4. Write the taxonomy of learning system in Artificial Intelligence with example for each. (3 Marks)