Tribhuvan University
**Institute of Science and Technology**
2067
✡

Bachelor Level/ Third Year/ Fifth Semester/ Science — Full Marks: 60
**Computer Science and Information Technology (CSc. 304)** — Pass Marks: 24
(Artificial Intelligence) — Time: 3 hours.

*Candidates are required to give their answer in their own words as for as practicable.*

**Attempt all the questions.** **(6 x 10 = 60)**



1. Define Artificial Intelligence (AI). Explain the behaviors of the AI. What do you mean by Turing Test? Explain it.

2. Why disjunctive normal form is required? Explain all the steps with examples.

3. "A person born in Nepal, each of whose parents is a Nepali citizen by birth, is a Nepali citizen by birth. A person born outside Nepal, one of whose parents is a Nepali citizen by birth, is a Nepali citizen by decent. Several developed countries have dual citizenship provision, but Nepal doesn't have that provision." Represent the above sentences in first-order logic and explain each step.

4. Differentiate between inference and reasoning. Why probabilistic reasoning is important in the AI? Explain with an example.

5. Justify that searching is one of the important part of AI. Explain in detail about depth first search and breadth first search techniques with an example.

6. Define Learning. Why learning frame work is required? Explain about learning frame with block diagram and examples.

7. What is Bayes' theorem? Explain its applications.

8. What is back propagation? Explain all the steps involved in the back propagation with an example.

9. How can you construct expert system? Explain knowledge engineering with a block diagram.

10. Define natural language processing. Explain the different issues involved in the natural language processing.

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1. What is Artificial Intelligence (AI)? Describe your own criteria for computer program to be considered intelligent.

2. For each of the following agents, determine what type of agent architecture is most appropriate (i.e. table lookup, simple reflex, goal-based or utility based).

   a. Medical diagnosis system
   b. Satellite image analysis system
   c. Part-pricking robot
   d. Refinery controller

3. What is state space representation of problem? Represent the root finding problem having four cities in to state representation (you can choose any ordering of cities and links) and devise the complete problem formulation.

4. What is heuristic information? Suppose that we run a greedy search algorithm with h(n) – g(n) and h(n) = g(n). What sort of search will the greedy search follow in each case?

5. State whether the following sentences are valid, unsatisfiable, or neither.

   a. Smoke = > Smoke
   b. Smoke = > Fire
   c. ( Smoke = > Fire) = > (~Smoke = > ~Fire)
   d. Smoke V Fire V ~Fire

6. Consider the knowledge base:

   "If it is hot and humid, then it is raining. If it is humid, then it is hot. It is humid"

   a. Describe a set of propositional letters which can be used to represent the knowledge base.
   b. Translate the KB into propositional letters using your propositional letters from part a.
   c. Is it raining? Answer this question by using logical inference rule with KB.

7. What do you mean by knowledge representation? Explain the characteristics of representation.

8. Define the Model-Based and Cased Based system. Discuss which system is suitable for the following problems.

    a. Electronic Circuit Testing
    b. Legal Reasoning
    c. Disease Recognition

9. What is Bayes' rule? Discuss the use of Bayes' rule for uncertain reasoning.

10. After your yearly checkup, the doctor has bad news and good news. The bad news is that you tested positive for a serious disease, and the test is 99% accurate (i.e. the probability of testing positive given that you have the disease is 0.99, as is the probability of testing negative if you don't have the disease). The good news is that this is a rare disease, striking only one in 10,000 people.

    a. Why is it good news that the disease is rare?
    b. What are the chances that you actually have the disease?

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1. What do you mean by forward chaining? Why it is required? Explain it with two practical examples.

2. "System that think like humans" and "System that act like humans" are the part of artificial intelligence. Justify that statement with practical examples.

3. Why normal forms are required in AI? How do you convert to the disjunctive normal form? Explain all the steps with practical examples.

4. "A deductive system is sound if any formula that can be derived in the system is logically valid. Conversely, a deductive system is complete if every logically valid formula is derivable. All of the system discussed in this article are both sound and complete. They also share the property that it is possible to effectively verify that a purportedly valid deduction is actually a deduction; such deduction systems are called effective". Represent the above sentences in first-order logic and explain each step.

5. Justify that AI can't exist without searching. Explain in detail about any two types of informed search with practical examples.

6. Why do we require learning? Explain about learning framework with suitable block diagram and examples.

7. What do you mean by casual network? Explain it with practical application.

8. What is a Neural Network? Explain any one type of neural network with practical example.

9. Knowledge consists of facts, beliefs, and heuristics, justify it. Explain the advantages and disadvantages of an expert system.

10. Differentiate between natural language understanding (NLU) and natural language generating (NLG). Why we have to study natural language processing? Explain it.