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Institute of Science and Technology
2067
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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 answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all the questions.   (10x6=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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Institute of Science and Technology
2068
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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 answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all the questions.   (10x6=60)

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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Bachelor Level/ Third Year/ Fifth Semester/ Science   Full Marks: 60
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Candidates are required to give their answers in their own words as far as practicable.
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Attempt all the questions.   (10x6=60)

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.

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Institute of Science and Technology
2070
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Bachelor Level/ Third Year/ Fifth Semester/ Science   Full Marks: 60
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Candidates are required to give their answers in their own words as far as practicable.
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Attempt all the questions.   (10x6=60)

1. What is 'Turing Test' in Artificial Intelligence (AI)? Criticize the performance of the 'Turing Test' to measure the intelligence of the machine.

2. Explain the uninformed search techniques with example.

3. If we set the heuristic function h(n)=g(n) for both greedy as well A*. What will be effect in the algorithms? Explain?

4. The minimax algorithm returns the best move for MAX under the assumption that MIN play optimally. What happens when MIN plays suboptimally?

5. Translate the following sentence into first order logic:
    i. "Everyone's DNA is unique and is derived from their parents' DNA".
    ii. "No dog bites a child of its owner".
    iii. "Every gardener likes the sun".
    iv. "All purple mushrooms are poisonous".

6. Represent the following sentences into a semantic network.
    Birds are animals.
    Birds have feathers, fly and lay eggs.
    Albatross is a bird.
    Donald is a bird.
    Tracy is an albatross.

7. What is an expert system? Explain the architecture and feature of rule-based expert system.

8. What are conceptual graphs? Represent the following statements into conceptual graph.
    "King Ram marry Sita, the daughter of king Janak".

9. What is machine learning? Explain the learning from analogy and instance based learning?

10. What is Bayesian Network? Explain how Bayesian Network represents and inference the uncertain knowledge.

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Institute of Science and Technology
2071
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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 answers in their own words as far as practicable.
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Attempt all the questions.   (10x6=60)

1. Define with suitable supporting statements and examples, "Artificial Intelligence is the system that act like humans".

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 imagine analysis system
   c. Part-picking robot
   d. Refinery controller

3. Consider the following graph, steps cost is given on the arrow: Assume that the successors of a state are generated in alphabetical order, and that there is no repeated state checking. A is the starting node and C is goal node.
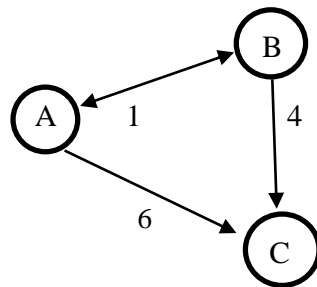
   a. Of the four algorithms breadth-first, depth-first and iterative-deepening, which find a solution in this case?
   b. Write sequence of node expanding by algorithm if finds solution.

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

5. Briefly describe the approaches of knowledge representation with example.

6. Consider the following sentence:

   [(food => party) V (drinks => party)] => [(food ^ drinks) => party]

   a. Convert the right hand and left hand sides of main implication into CNF.
   b. Prove the validity of sentence using resolution.

7. Convert the following sentence into predicate logic.

   a. "No dog bites a child of its owner"?
   b. "No two adjacent countries have the same color"?

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

9. What is the difference between symbolic and non-symbolic AI? Represent the following knowledge in semantic network.
   Robin is bird
   Clyde is a Robin
   Clyde owns a nest from spring 2014 to fall 2014

10. Explain the steps of Natural Language Processing.

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Institute of Science and Technology
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Bachelor Level/ Third Year/ Fifth Semester/ Science	Full Marks: 60
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(Artificial Intelligence)	Time: 3 hours

Candidates are required to give their answers in their own words as far as practicable.
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Attempt all questions. (10x6=60)

1. Define backward chaining. Explain the importance of backward chaining with two practical examples.

2. Justify that "System that think rationally" and "System that act rationally" are the part of artificial intelligence. Explain it with practical examples.

3. How do you convert to conjunctive normal form? Explain all the steps with examples.

4. "A key property of deductive systems is that they are purely syntactic, so that derivations can be verified without considering any interpretation. Thus a sound argument is correct in every possible interpretation of the language, regardless whether that interpretation is about mathematics, economics, or some other area. The artificial intelligence deals with deductive system soundly". Represent the above sentences in first-order logic and explain each step.

5. Searching is an important part of AI, justify it. Explain any two types of blind search with suitable examples. How can you expand it to informed search?

6. What is learning by induction? Explain inductive learning process with example.

7. What do you mean by reasoning in belief network? Explain it with example.

8. Derive the mathematical model of neural network. Explain any one type of neural network with its algorithm.

9. Why do we require expert system structure? Draw the block diagram and explain it with practical example.

10. Explain the different steps involved in the natural language processing (NLP) with block diagram and examples.

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Tribhuvan University
Institute of Science and Technology
2073
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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 answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all the questions.   (10x6=60)

1. Do you agree "the development of Artificial Intelligence has had some negative effect on the society"? If you agree list some of them and put your opinion in the support of development of Artificial Intelligence.

2. What is 'Turing Test in AI? Criticize the performance of the 'Turing Test' to measure the intelligent of the machine.

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

4. What is meant by admissible heuristic? What improvement is done in A* search than greedy Search? Prove that A* search gives us optimal solution if the heuristic function is admissible.

5. Define a natural language processing. Explain the different issues involved in the natural language processing.

6. Differentiate between inference and reasoning. Why probabilities reasoning is important in AI? Explain with an example.

7. What is Bayesian network? Explain how Bayesian network represent and inference the uncertain knowledge.

8. Consider the following statements:

    Rabin likes only easy courses. Science courses are hard. All courses in the CSIT are easy. CSC 101 is a CSIT course.
    a. Translate the sentences into predicate logic.
    b. Convert your sentences into clausal normal form (CNF).

9. What are conceptual graphs? Represent the following statements into conceptual graph.

    King Ram marry Sita, the daughter of king Janak.

10. Define the Model-Based and Cased Based system. Discuss which system is suitable for the following problems
    i.   Electronic circuit testing
    ii. Legal Reasoning