

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2021
 Programme: BE Full Marks: 100
 Course: Artificial Intelligence and Neural Network Pass Marks: 45
 Time : 3hrs.

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.

1. a) What are the different types of intelligence? Explain in brief. 7
 b) Describe the structure of an intelligent agent. What are the different types of intelligent agents? Explain in brief. 8
2. a) What are the components of production system? Formulate the "Farmer, Wolf, Duck and Corn Problem": A farmer with his wolf, duck and bag of corn come to the east side of a river they wish to cross. There is a boat at the rivers edge, but of course only the farmer can row. The boat can only hold two things (including the rower) at any one time. If the wolf is ever left alone with the duck, the wolf will eat it. Similarly if the duck is ever left alone with the corn, the duck will eat it. How can the farmer get across the river so that all four arrive safely on the other side? 7
 b) What are the constraint satisfaction problems and how are they resolved? Explain with the crypt-arithmetic problem: T W O + T W O = F O U R. 8
3. a) What is machine learning? Explain explanation-based learning with suitable example. 8
 b) Explain the Genetic algorithm in detail. 7
4. a) Convert the following facts into predicate logic: 8
 1. Marcus was a man.
 2. Marcus was a Pompeian.
 3. All Pompeians were Romans.
 4. Caesar was a ruler.
 5. All Romans were either loyal to Caesar or hated him.
 6. Every one is loyal to someone.
 7. People only try to assassinate rulers they are not loyal to.

8. Marcus tried to assassinate Caesar.

b) Consider the following facts in predicate logic: 7

1. $\forall x : \text{food}(x) \rightarrow \text{likes}(\text{John}, x)$
2. $\text{food}(\text{Apple}) \wedge \text{food}(\text{chicken})$
3. $\forall a : \forall b : \text{eats}(a, b) \wedge \sim \text{killed}(a) \rightarrow \text{food}(b)$
4. $\text{eats}(\text{Mary}, \text{Peanuts}) \wedge \text{alive}(\text{Mary})$
5. $\forall c : \text{eats}(\text{Mary}, c) \rightarrow \text{eats}(\text{Bob}, c)$
6. $\forall d : \text{alive}(d) \rightarrow \sim \text{killed}(d)$
7. $\forall e : \sim \text{killed}(e) \rightarrow \text{alive}(e)$

Convert these facts into CNF and prove: likes(John, Peanuts) using resolution.

5. a) What is adversarial search? Explain the Mini-Max Algorithm with suitable example. 8
 b) What is an Expert System? Explain how the inference engine in the expert system works using forward and backward chaining. 7
6. a) Explain how a perceptron is trained to learn logical AND operation. Assume weights $w_1 = -0.3$ and $w_2 = 0.5$ and learning rate $\alpha = 0.3$. 8
 b) What is pragmatic analysis in Natural Language Processing (NLP)? Explain with an appropriate example. Briefly explain two real World application areas of NLP. 4+3
7. Write short notes on: (Any two) 2×5
 - a) Hopfield Network
 - b) Reasoning under uncertainty
 - c) Frames