

- c Discover the operation of the unification algorithm on each of the following pairs of literals 04
- $f(\text{Marcus})$ and $f(\text{Caesar})$
 - $f(x)$ and $f(g(y))$
 - $f(\text{Marcus}, g(x, y))$ and $f(x, g(\text{Caesar}, \text{Marcus}))$
 - $P(A, B, B)$ and $P(x, y, z)$

OR

- 4 a Explain Ensemble learning and discuss the key idea of boosting. How does the boosting approach encourage creating diverse ensemble 10
- b Consider the following facts 10
- Steve only likes easy courses
 - Science courses are hard
 - All the course in the basket weaving department are easy
 - BK301 is a basket weaving course
- Design the knowledge base using predicate logic for the above facts
 - Using resolution mechanism answer the question "What course would Steve like?"

UNIT 4

- 5 a Write a pseudo code for adaptive dynamic programming and explain the utility update function. 10
- b Write a pseudo code for a passive reinforcement learning agent that learns utility estimates using temporal differences and explain how it differs from adaptive dynamic programming 10

OR

- 6 a Design a Naïve bayes classifier using the following dataset to predict the chance of playing golf when Outlook=Rainy, Temp=Cool, Humidity=High and Windy=True 10

Outlook	Temp	Humidity	Windy	Play Golf
Rainy	Hot	High	False	No
Rainy	Hot	High	True	No
Overcast	Hot	High	False	Yes
Sunny	Mild	High	False	Yes
Sunny	Cool	Normal	False	Yes
Sunny	Cool	Normal	True	No
Overcast	Cool	Normal	True	Yes
Rainy	Mild	High	False	No
Rainy	Cool	Normal	False	Yes
Sunny	Mild	Normal	False	Yes
Rainy	Mild	Normal	True	Yes
Overcast	Mild	High	True	Yes
Overcast	Hot	Normal	False	Yes
Sunny	Mild	High	True	No

- b Describe the Bayes Theorem. What is the maximum a posteriori (MAP) hypothesis and how can you calculate it using Bayes theorem? What is the maximum likelihood (ML) hypothesis and under what condition is it identical with the MAP hypothesis. 10

UNIT 5

- 7 a Given the facts 10
- Jack owns a dog.
 - Every dog owner is an animal lover.
 - No animal lover kills an animal.
 - Either Jack or Curiosity killed the cat, who is named Tuna.
- Prove using resolution that "Did Curiosity kill the cat?"
- b Demonstrate the concept of Ocam's razor with respect to inductive learning. 05
- c Translate the following sentences to FOL [First Order Logic] 05
- Every student who takes Analysis also takes Geometry
 - John did not study but he is lucky
 - All students are smart
 - No students can fool all the other students

[illegible]

Autonomous Institute Affiliated to VTU

Course : Artificial Intelligence
Course Code : 16CS6DEAIN

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Max Marks: 100
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UNIT 1

- | | | | |
|---|------|---|----|
| 1 | a | Define AI. Explain the interaction between Agents and environment. | 05 |
| | b | Explain different properties of task environment. | 07 |
| | c | Develop the PEAS description and properties of the task environment for | 08 |
| | i. | Shopping for used AI books on the Internet. | |
| | ii. | Mathematician's theorem proving assistant. | |
| | iii. | Vacuum cleaner Agent. | |
| | iv. | Chess Agent. | |

2 a Write an algorithm for knowledge based agents. 05
 b Use the truth tables method to infer whether the following are valid or 05
 unsatisfiable.
 (i) $P \Rightarrow (P \vee Q)$
 (ii) $((P \Rightarrow Q) \wedge \neg Q) \Rightarrow \neg P$
 c Prove each of the following assertions: 10
 a. a is valid if and only if $\text{True} \models a$.
 b. For any a , $\text{False} \models a$.
 c. $\alpha \models \beta$ if and only if the sentence $(\alpha \Rightarrow \beta)$ is valid.
 d. $\alpha \equiv \beta$ if and only if the sentence $(\alpha \Leftrightarrow \beta)$ is valid.
 e. $\alpha \models \beta$ if and only if the sentence $(\alpha \wedge \neg \beta)$ is unsatisfiable.

3	a	Consider the problem faced by an infant learning to speak and understand a language. Explain how this process fits into the general learning model, and identify each of the components of the model	08
	b	Explain decision tree learning algorithm and discuss how attributes are selected to generate a decision tree with an example	08