Enrollment No...................................

Faculty of Engineering

End Sem (Even) Examination May-2022

CB3CO14 Artificial Intelligence

Programme: B.Tech.   Branch/Specialisation: CSBS

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1　i.　Artificial intelligence is:　　　　　　　　　　　　　　1
　　　　(a) The embodiment of human intellectual capabilities within a computer
　　　　(b) A set of computer programs that produce output that would be considered to reflect intelligence if it were generated by humans
　　　　(c) The study of mental faculties through the use of mental models implemented on a computer
　　　　(d) All of these

　　ii.　Which of the following is/are the composition for AI agents?　1
　　　　(a) Program only　　　　(b) Architecture only
　　　　(c) Both (a) and (b)　　　(d) None of these

　　iii.　What is the evaluation function in A* approach?　　　1
　　　　(a) Heuristic function
　　　　(b) Path cost from start node to current node
　　　　(c) Path cost from start node to current node + Heuristic cost
　　　　(d) Average of Path cost from start node to current node and Heuristic cost

　　iv.　Hill climbing sometimes called _____ because it grabs a good　1
　　　　Neighbor state without thinking ahead about where to go next.
　　　　(a) Needy local search　　(b) Heuristic local search
　　　　(c) Greedy local search　　(d) Optimal local search

　　v.　In alpha-beta pruning, _____ is used to cut off the search at　1
　　　　maximizing level only and _____is used to cut off the
　　　　search at minimizing level only.
　　　　(a) Alpha, beta　　　　　(b) Beta, alpha
　　　　(c) Alpha, alpha　　　　　(d) Beta, beta

P.T.O.

vi. In constraint satisfaction problem, constraints can be stated as _____. **1**

    (a) Arithmetic equations and inequalities that bind the values of variables

    (b) Arithmetic equations and inequalities that doesn't bind any restriction over variables

    (c) Arithmetic equations that impose restrictions over variables

    (d) Arithmetic equations that discard constraints over the given variables

vii. Translate the following statement into FOL. **1**

"For every a, if a is a PhD student, then a has a master degree"

    (a) $\forall$ a PhD(a) -> Master(a)   (b) $\exists$ a PhD(a) -> Master(a)

    (c) (a) is true, (b) is true   (d) (a) is false, (b) is false

viii. Which of the following is not a type of inheritance knowledge representation technique? **1**

    (a) Script   (b) Frame

    (c) Predicate logic   (d) Semantic Network

ix. What does the Bayesian network provide? **1**

    (a) Complete description of the domain

    (b) Partial description of the domain

    (c) Complete description of the problem

    (d) None of these

x. An expert system shell is an expert system without: **1**

    (a) Domain Knowledge

    (b) Explanation Facility

    (c) Reasoning with knowledge

    (d) All of these

Q.2 i. Define agent, environment. State the characteristics of an intelligent agent. **2**

    ii. Define a problem. Explain problem characteristics. **3**

    iii. Explain state space with the help of water-jug problem. **5**

OR iv. Define production system. Also, explain the features of a good production system. **5**

Q.3 i. Differentiate between depth first search and breath first search techniques. **3**

    ii. Write down the A* Algorithm. Also, justify the statement that "A* algorithm is optimal when heuristic function is admissible". **7**

OR iii. Explain hill-climbing and simulated annealing algorithms. **7**

Q.4 i. Define constraint satisfaction problem problems. Give some examples of constraint satisfaction problems. **3**

    ii. Solve the following crypt-arithmetic problem: **7**

$$\begin{array}{r} \text{CROSS} \\ + \text{ROADS} \\ \hline \text{DANGER} \end{array}$$

OR iii. Explain game playing with the help of min-max search algorithm. **7**

Q.5 i. Differentiate between procedural and declarative knowledge. **2**

    ii. Define propositional logic and predicate logic. Consider the following sentences and translate these sentences into formulas in predicate logic: **8**

    (a) John likes all kinds of food.

    (b) Apples are food.

    (c) Chicken is food.

    (d) Anything anyone eats and isn't killed by is food.

    (e) Bill eats peanuts and is still alive

    (f) Sue eats everything Bill eats.

OR iii. Explain forward and backward reasoning, monotonic and non-monotonic reasoning with a suitable example. **8**

Q.6 i. Describe Bayes' Theorem. Show how it is useful in handling uncertain knowledge. **4**

    ii. Describe Dempster-Shafer theory in detail with an example. **6**

OR iii. Define expert system. Also, explain architecture of expert system with a neat diagram. **6**

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Marking Scheme
CB3CO14 Artificial Intelligence

Q.1   i.   Artificial intelligence is: **1**
(d) All of these

ii.   Which of the following is/are the composition for AI agents?   **1**
(c) Both (a) and (b)

iii.   What is the evaluation function in A* approach?   **1**
(c) Path cost from start node to current node + Heuristic cost

iv.   Hill climbing sometimes called _____ because it grabs a good   **1**
Neighbor state without thinking ahead about where to go next.
(c) Greedy local search

v.   In alpha-beta pruning, _____ is used to cut off' the search at   **1**
maximizing level only and _____is used to cut off the
search at minimizing level only.
(b) Beta, alpha

vi.   In constraint satisfaction problem, constraints can be stated as   **1**
_____.
(a) Arithmetic equations and inequalities that bind the values of
variables

vii.   Translate the following statement into FOL.   **1**
"For every a, if a is a PhD student, then a has a master degree"
(a) ∀ a PhD(a) -> Master(a)

viii.   Which of the following is not a type of inheritance knowledge   **1**
representation technique?
(c) Predicate logic

ix.   What does the Bayesian network provide?   **1**
(a) Complete description of the domain

x.   An expert system shell is an expert system without: **1**
(a) Domain Knowledge

Q.2   i.   Definition   1 mark   **2**
      Two characteristics   1 mark

ii.   Definition   1 mark   **3**
      Two characteristics   2 marks

iii.   Complete space with the help of water-jug problem   **5**
      As per explanation   5 marks

OR   iv.   Definition   2 marks   **5**

    Any three features   3 marks

Q.3   i.   Any three Difference   (1 mark * 3)   3 marks   **3**
ii.   A* Algorithm   4 marks   **7**
      Justification with example   3 marks
OR   iii.   Hill-climbing algorithm   4 marks   **7**
      Simulated annealing algorithm   3 marks

Q.4   i.   Definition   1 mark   **3**
      Examples   2 marks
ii.   As per Solution   7 marks   **7**
OR   iii.   Game playing   3 marks   **7**
      Min-max search algorithm with example   4 marks

Q.5   i.   Differences   2 marks   **2**
ii.   Propositional logic and predicate logic   2 marks   **8**
      Six logic statements   (1 mark * 6)   6 marks
OR   iii.   Forward and backward reasoning (at least 4)   4 marks   **8**
      Monotonic and non-monotonic reasoning with example
        4 marks

Q.6   i.   Bayes' Theorem   2 marks   **4**
      Justification   2 marks
ii.   Dempster-Shafer theory in detail with an example   **6**
      As per explanation   6 marks
OR   iii.   lso, explain architecture of expert system with a neat diagram.   **6**
      Definition   2 marks
      Architecture with diagram   4 marks

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