			Marks	BL	CO	PO	PSO
Q.5	i.	What are expert system shells? Provide an overview of commonly used shells like CLIPS, Jess, and Drools.	4	3	2	4	1
	ii.	Explain the steps involved in building an expert system, including knowledge base creation, rule development, and testing.	6	2	1	4	2
OR	iii.	Discuss the techniques for evaluating and validating expert systems, emphasizing their importance in ensuring performance and accuracy.	6	2	1	4	2
Q.6		Attempt any two:					
	i.	Explain how expert systems can be integrated with IoT and big data analytics. Provide examples of their combined applications.	5	2	2	5	1
	ii.	Discuss the ethical and social implications of expert systems, focusing on trust, accountability, and job displacement.	5	3	1	5	1
	iii.	Describe the future trends in expert systems, including advancements in adaptive and self-learning systems, and their emerging applications in various fields.	5	2	2	5	2

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

Faculty of Engineering
End Sem Examination Dec 2024

CS3EA16 Expert Systems

Programme: B.Tech   Branch/Specialisation: CSE All

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. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	BL	CO	PO	PSO
Q.1	i.	Which of the following is a primary component of an expert system? (a) Database (b) Knowledge base (c) Spreadsheet (d) Word processor.	1	1	1	1	1
	ii.	Which component of an expert system provides explanations for its decisions? (a) Knowledge base (b) Inference engine (c) Explanation facility (d) User interface	1	1	1	2	1
	iii.	What is the main goal of knowledge acquisition in expert systems? (a) To store large amounts of data (b) To extract and formalize knowledge from human experts (c) To design user interfaces (d) To simulate physical systems	1	1	2	1	1
	iv.	In expert systems, ontologies are used to: (a) Provide hardware specifications (b) Define concepts and relationships within a domain (c) Manage system resources (d) Optimize system performance	1	1	2	1	1

P.T.O.

[2]

v. Which inference mechanism starts with known facts and applies rules to derive a conclusion? **1** 1 3 1 1
(a) Backward chaining
(b) Forward chaining
(c) Case-based reasoning
(d) Modular reasoning

vi. Case-based reasoning in expert systems relies on: **1** 1 3 2 1
(a) Rules and logic
(b) Past experiences and similar cases
(c) Hypothesis testing
(d) Direct user input

vii. Which of the following is an example of an expert system shell? **1** 1 4 2 1
(a) Python   (b) CLIPS
(c) SQL   (d) Excel

viii. In which phase is rule testing commonly performed in expert system development? **1** 1 1 4 1
(a) Knowledge acquisition
(b) Rule development
(c) Validation phase
(d) Maintenance phase

ix. How can expert systems be integrated with IoT technologies? **1** 1 1 5 1
(a) By replacing IoT sensors with expert systems
(b) By using IoT to gather real-time data for decision-making
(c) By converting expert systems into IoT devices
(d) By eliminating the need for rule-based reasoning

x. What is a key challenge in ensuring scalability in expert systems? **1** 1 1 5 1
(a) Limiting the knowledge base to avoid complexity
(b) Maintaining system performance as the knowledge base grows

[3]

(c) Reducing the number of rules in the inference engine
(d) Ensuring the system runs on outdated hardware

Q.2 i. Define an expert system and mention two real-world applications. **2** 1 1 1 1

ii. Briefly explain the components of an expert system. **3** 1 1 1 2

iii. Compare and contrast expert systems and conventional systems in terms of architecture and functionalities. **5** 3 1 1 2

OR iv. Discuss the history and evolution of expert systems, highlighting their role in the development of AI. **5** 2 2 1 1

Q.3 i. What is knowledge acquisition? Why is it essential in expert systems? **2** 1 2 2 1

ii. Explain the process of knowledge engineering in expert systems. Highlight the roles and responsibilities of a knowledge engineer. **8** 2 2 2 2

OR iii. Discuss structured knowledge representation techniques in expert systems, focusing on production rules, decision tables, and the role of ontologies. **8** 2 1 2 2

Q.4 i. Differentiate between forward chaining and backward chaining in inference mechanisms. **3** 2 1 3 1

ii. Describe the structure and function of rule-based systems and discuss their application in expert systems. **7** 2 1 3 1

OR iii. Explain the different architectural approaches for designing expert systems, focusing on modular, distributed, and blackboard architectures. **7** 2 1 3 2

Q.1   i)   b) Knowledge base.   1
      ii)   c) Explanation facility.   1
      iii)   b) To extract and formalize knowledge from human experts.   1
      iv)   b) Define concepts and relationships within a domain.   1
      v)   b) Forward chaining.   1
      vi)   b) Past experiences and similar cases.   1
      vii)   b) CLIPS.   1
      viii)   c) Validation phase.   1
      ix)   b) By using IoT to gather real-time data for decision-making   1
      x)   b) Maintaining system performance as the knowledge base grows.   1

Q.2   i.   Define an expert system and mention two real-world   2
              applications?
              Definition 2 marks

      ii.   Briefly explain the components of an expert system?   3
              Explanation 3 marks

      iii.   Compare and contrast expert systems and conventional systems in 5
              terms of architecture and functionalities?
              Comparison 2 marks
              Architecture 2 marks
              Functionalities 1 marks

OR   iv.   Discuss the history and evolution of expert systems, highlighting 5
              their role in the development of AI?
              History 2 marks
              Evolutions 2 marks
              Role in AI   1 marks

Q.3   i.   What is knowledge acquisition, and why is it essential in expert 2
              systems?
              Definition 2 marks.

      ii.   Explain the process of knowledge engineering in expert systems.   8
              Highlight the roles and responsibilities of a knowledge engineer?
              Process 4 marks.
              Roles 2 marks.
              Responsibilities   2 marks.

OR   iii.   Discuss structured knowledge representation techniques in expert   8
              systems, focusing on production rules, decision tables, and the
              role of ontologies?
              Structure knowledge 4 marks.
              Production rule 2 marks.
              Role of ontologies 2 marks.

Q.4   i.   Differentiate between forward chaining and backward chaining in   3
              inference mechanisms (Only Three)?
              Three Differences each 1 marks

      ii.   Describe the structure and function of rule-based systems and   7
              discuss their application in expert systems?
              Structure base system 2 marks
              Function base system 2 marks
              Application   3 marks

OR   iii.   Explain the different architectural approaches for designing expert 7
              systems, focusing on modular, distributed, and blackboard
              architectures?
              Modular architecture – 2 marks
              Distributed architecture-2 marks
              blackboard architecture-3 marks

Q.5   i.   What are expert system shells? Provide an overview of commonly   4
              used shells like CLIPS, Jess, and Drools.
              System Shells   1 marks
              CLIPS   1 marks
              Jess   1 marks   Drools   1 marks

      ii.   Explain the steps involved in building an expert system, including 6
              knowledge base creation, rule development, and testing?
              Explanations overall terms each   6 marks
              knowledge base 2 mark
              rule development 2 mark
              testing 2 mark

OR   iii.   Discuss the techniques for evaluating and validating expert   6
              systems, emphasizing their importance in ensuring performance

and accuracy?
Techniques 2 marks
Discussion 4 marks

Q.6   Attempt any two:
   i.   Explain how expert systems can be integrated with IoT and big   **5**
             data analytics. Provide examples of their combined applications?
             Integration with IoT 2 marks
             Applications   3 marks
   ii.   Discuss the ethical and social implications of expert systems   **5**
             focusing on trust, accountability, and job displacement?
             Implications 2 each 1 marks
             Explanation   3 marks

   iii.   Describe the future trends in expert systems, including   **5**
             advancements in adaptive and self-learning systems, and their
             emerging applications in various fields?
             Future trends   2 marks
             Applications   3 marks

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