

Module-1 Introduction

Short Answer Questions:

1. Define the term Artificial Intelligence (AI).
2. List the two general approaches used by AI researchers.
3. State the basic objective of bottom-up approach in building intelligent machines.
4. What are systems that provide assistance in decision making through inferences?
5. Give an example of system that:
 - a. Thinks like humans
 - b. Thinks rationally
6. Give an example of system that:
 - a. Acts like humans
 - b. Acts rationally
7. Which component determines rules in an AI program?
8. Which component derives new knowledge using inference rules in an AI program?
9. List any two commonly used AI techniques and theories.
10. State the equivalent ternary number for the given decimal number 4.
11. Which algorithms are favored for search problems and requires identification of a global optimal solution?
12. What is the basic purpose of Ant colony algorithm?
13. State at least two characteristics of neural networks.

Long Answer Questions:

1. What is the primary goal of a Turing test?
2. Why did earlier AI programs like ELIZA failed to prove their intelligence?
3. "AI is interdisciplinary in nature and its foundations are in various fields." Justify the statement with valid reasons.
4. Which are the basic requirements that an AI program should fulfill? Explain any two along with an example.
5. State at least two points of difference between:
 - a. Systems that think like human and systems that act like human.
 - b. Systems that think like human and systems that think rationally.
 - c. Systems that act like human and systems that act rationally.
 - d. Systems that think rationally and systems that act rationally
6. Write short notes on :
 - a. Sub-areas of AI
 - b. Applications of AI
7. "Hard computing and soft computing are dependent on each other." Justify the statement.
8. "Soft computing plays an important role in science and engineering." Justify.
9. "Swarm intelligence is a type of artificial intelligence." Validate the statement.
10. How has the emergence of agent technology brought a paradigm shift in software development?

Multiple Choice Questions:

1. AI is a combination of
 - i. Computer science
 - ii. Physiology
 - iii. Philosophy
 - iv. Pharmacology
 - a. i,ii,iii,iv
 - b. i & ii

- c. i,ii &iii
d. ii & iii
2. Applications of experts systems are:
- Forecasting of stock market
 - Diagnose disease
 - Instructing miners to find mineral locations
 - Display results
- i,ii,iii,iv
 - i & ii
 - i,ii &iii
 - ii & iii
3. AI program must have capability of:
- Learning
 - Reasoning
 - Inferencing
 - Perceiving
 - Comprehending
- i,ii,iii,iv
 - ii,iii,iv, v
 - i,ii,iii, v
 - i,ii,iii,iv,v
4. The first view of AI is about duplicating what the human brain does is ____.
- Cognitive science
 - Simulation
 - Emulation
 - Reasoning
- Only i
 - Both i & ii
 - iii & iv
 - i, ii, iii & iv
5. The second view of AI is about duplicating what human brain should do is doing things ____.
- Cognitive science
 - Simulation
 - Rationally
 - Reasoning
- Only i
 - Both i & ii
 - Only iii
 - Both iii & iv
6. Turing is an example of ____.
- Systems that thinks like human
 - Systems that thinks rationally.
 - Systems that act like human
 - Systems that act rationally
- Only ii
 - Both i & ii
 - Only iii
 - Both iii & iv
7. Neural network is an example of ____.
- Systems that thinks like human
 - Systems that thinks rationally.
 - Systems that act like human
 - Systems that act rationally
- Only i

- b. Both i & ii
 - c. Only iv
 - d. Both iii & iv
8. Components of soft computing includes:
- i. Neural network
 - ii. Fuzzy systems
 - iii. Evolutionary algorithms
 - iv. Swarm intelligence
- a. i, ii,iii
 - b. ii, iii, iv
 - c. i, ii, iii, iv
 - d. i ,ii,iv
9. The advantages of swarm intelligence are:
- i. Adaptability, Robustness
 - ii. Reliability, Simplicity
 - iii. Portability ,Adaptability
 - iv. Reliability, Security
- a. i, ii,iii
 - b. ii, iii, iv
 - c. Both i and ii
 - d. Both iii and iv
10. Evolutionary techniques mostly involves :
- i. Meta heuristic optimization algorithms
 - ii. Swarm intelligence
 - iii. Management science
 - iv. Control strategy
- a. Only i
 - b. Only ii
 - c. Both i and ii
 - d. Both iii and iv

Fill in the blanks:

1. The foundation of AI was laid with the development of _____theory.
2. _____ networks were used to stimulate brain functioning.
3. _____ are viewed to be entities that receive percepts constantly from dynamic environment.
4. The art of creating machines that performs functions which requires _____ when performed by people is also known as AI.
5. Emergent behavior of self-organization by a group of social insects is known as _____intelligence.
6. The magic square of order n consists of ___ distinct numbers.
7. Steam engine governor is an example of __._____theory

Module-2 Knowledge Representation

Short Answer Questions:

1. What is Knowledge Representation (KR)?
2. State the fundamental goal of KR.
3. What is common between SGML, XML and RDF?
4. List the 4 properties any KR system should possess.
5. Which property of KR refers to a capability that acquires new knowledge, behaviors and understanding?
6. State the meaning of the given predicate logic: “ $(\forall X) \text{human}(X) \leftarrow \text{mortal}(X)$ ”

7. What do you understand by the ability to acquire new knowledge using automatic methods?
8. Which ability does inferential adequacy of KR covers?
9. Give an example of relational knowledge.
10. Which approach of KR would answer the given question? "What is the age of Mr. Boole?"
11. Which approach of KR would fail to answer the given question? "Does a student having IBM/MS certifications earn more?"
12. Write the clausal form for the given English query "Does Jay breathe"?
13. Write the clausal form for the given English query "Is Jay human"?
14. Write the English query for the given clausal form "?-subclass (woman, living_thing)".
15. List the two advantages of knowledge represented as logic.
16. Define the term procedural knowledge. State any one application where procedural knowledge be used.
17. State the two limitations of procedural knowledge.
18. Which approach of knowledge representation would fail to answer the given question? "Does a student having IBM/MS certifications earn more?" Why?
19. "Forward reasoning inference mechanism in clausal logic derives new assertion from old ones." Prove this statement with the help of modus ponens rule.
20. Under what circumstances in an ESN a denial link is added?
21. How does contradiction and resolution helps achieving inference in backward reasoning?

Long Answer Questions:

1. Explain any two points of difference between forward reasoning and backward reasoning inference mechanism.
2. Under which circumstances should Inst and Part be used? Explain with the help of an Extended Semantic Network.
3. Describe in detail the steps to implement Frame knowledge.
4. "Frames are regarded as an extension to semantic nets." Justify the statement.
5. With the help of an example discuss how inheritance is achieved in Semantic networks?
6. You are given old assertions and you have to derive new assertions from the same. Which inference mechanism would be appropriate? Why?
7. Justify with an example: "How are frames a machine usable formalization of concepts and schemas?"
8. Describe the technique which allows to invoke rules within frames.
9. With which components of RDBMS can F-Log and Hi-Log be compared to? How ?

Practice Examples:

1. Draw a semantic network representing the following knowledge:
 - a. Every vehicle is a physical object. Every car is a vehicle. Every car has four wheels. Electrical system is a part of car. Battery is a part of electrical system. Pollution system is a part of every vehicle. Vehicle is used in transportation. Swift is a car.
 - b. Every living thing needs oxygen to live. Every human is a living thing. Jay is human. Answer the query Jay is a living thing and needs oxygen to live using inheritance.
2. Write an inheritance rule in Prolog to answer queries related to the statements given in part(i) of Q.1, such as Swift has battery, electrical system, pollution system etc.
3. Consider the following clausal form:


```
isa(X, living_thing) <- isa(X, animate)
isa(X, animate) <- isa(X, human)
isa(X, human) <- isa(X, man)
isa(Jay, man)
```

 - a. Represent forward reasoning inference.
 - b. Represent backward reasoning inference.
4. For the following sentences express :
 - a. Binary clausal form
 - b. ESN representation

"Anyone who gives something he likes to a person likes that person also. Jay shares his AI notes and

tutorial to Ajay. Jay likes AI. "

5. Represent a Frame-Based System (FBS) for University in Prolog.
6. Create a network of frames(NOF) with **aki**, **a_part_of** and **inst** links with the following characteristics:
 - a. Insert a frame in NOF with all slot values filled up.
 - b. Delete a frame from NOF.
 - c. Update the values of the slot of a given frame.
 - d. Query module to ask questions using FBS.
7. For the given relationship expressed in clausal form: object (E, Assignment), action (E, Submit), actor (E, Student), recipient (E, Teacher), isa (Student, Human), isa (Teacher, Human).
 - a. Draw a semantic network.
 - b. In the above clausal form add location (E, Classroom) is added, draw the revised semantic network.
8. For the given clausal form give the binary representation and then draw Extended Semantic Networks:
 - a. Male(Student), Female(Student) ← Registered(Student)
 - b. Rootdirectory(University, Programme) ← Folder(University, Institute), File(Institute, Programme)