CSPC-405 Artificial Intelligence QUIZ Duration: 15 mins Max Marks: 10

Date_____ Roll No_____

Q.No.	1	2	3	4	5	6	7	8	9	10
Ans.										

1. What is the primary function of an expert system?
   a. To store large amounts of data
   b. To solve complex mathematical calculations
   c. To mimic the decision-making ability of a human expert
   d. To process high-speed image recognition tasks

2. Which of the following is a core component of an expert system?
   a. Image processor
   b. Knowledge base
   c. Audio synthesiser
   d. Random number generator

3. In an expert system, the "inference engine" is responsible for:
   a. Providing visual interfaces for users
   b. Updating the system's database
   c. Applying rules to draw conclusions from the knowledge base
   d. Managing system resources and hardware

4. Which of the following components of a knowledge representation is used for constructing legal sentences in logic?
   a. Syntax
   b. Semantics
   c. Knowledge Base
   d. Inference Engine

5. A semantic net is primarily used to:
   a. Represent procedural knowledge
   b. Store numerical data
   c. Represent relationships between concepts
   d. Manage audio and video files

6. Knowledge and reasoning also play a crucial role in dealing with _____ environment.
   a. Completely Observable
   b. Partially Observable
   c. Neither Completely nor Partially Observable
   d. Only Completely and Partially Observable

7. A) Knowledge base (KB) consists of a set of statements.
B) Inference is deriving a new sentence from the KB.
Choose the correct option.
   a. A is true, B is true
   b. A is false, B is false
   c. A is true, B is false
   d. A is false, B is true

8. Which of the following is NOT an advantage of using semantic nets in knowledge representation?
   a. Natural handling of relationships between entities
   b. Easy visualisation of complex structures
   c. Efficient handling of large volumes of unstructured data
   d. Ability to model inheritance and hierarchy

9. In the context of frames, a “slot” is used to represent:
   a. A single line of code
   b. An attribute or property of the frame
   c. The hierarchical position of the frame
   d. The execution time of the frame

10. Inference algorithm is complete only if _____
   a. It can derive any sentence
   b. It can derive any sentence that is an entailed version
   c. It is truth-preserving
   d. It can derive any sentence that is an entailed version & It is truth-preserving

CSPC-405 Artificial Intelligence QUIZ 2 Duration: 15 mins Max Marks: 10

Date_____ Roll No_____

Q.No.	1	2	3	4	5	6	7	8	9	10
Ans.										

1. Let p -->q be a proposition, which of the following is false?
   a. ~p -->~q is contrapositive of p-->q
   b. q-->p is converse of p-->q
   c. ~p-->~q is inverse of p-->q
   d. ~(q--> p) is inverse of p-->q

2. The chances of a defective screw in three boxes A, B, C are 1/5, 1/6 and 1/7 respectively. A box is selected at random, and a screw drawn from it at random is found to be defective. Find the probability that it came from box A.
   a. 40/107
   b. 41/107
   c. 42/107
   d. None of the above

3. Given that (a ∧ b) ∨ (~a ∧ ~b) is false, the truth values of a and b are
   a. both false
   b. both true
   c. a false and b true
   d. None of the above

4. Assume the following two propositions. A1: If a person is known to be corrupt, then he will not be elected.A2: If a person is kind, he will be elected. Which one of the following statements follows from A1 and A2 as per inference rules of logic?
   a. If a person is known to be corrupt, he is kind
   b. If a person is kind, he is not known to be corrupt
   c. If a person is not known to be corrupt, he is not kind
   d. If a person is not kind, he is not known to be corrupt

5. If A and B are two events such that P(A) ≠ 0 and P(A) ≠ 1, then P($\bar{A}$/$\bar{E}$)
   a. 1 - P(A/E)
   b. 1 - P($\bar{A}$/E)
   c. (1 - P(AUE))/P($\bar{E}$)
   d. P($\bar{A}$)/P($\bar{E}$)

6. What type of graph is used to represent a Bayesian network?
   a. Directed cyclic graph
   b. Undirected cyclic graph
   c. Directed acyclic graph (DAG)
   d. Undirected acyclic graph

7. What are the two components of a Bayesian network?
   a. Joint probability distribution and conditional probabilities
   b. Nodes and Arcs
   c. Directed Acyclic graph and table of conditional probabilities
   d. Causal components and Actual Numbers

8. Which of the following is true in the case of Decision theory?
   a. Decision Theory = utility theory + Probability theory
   b. Decision Theory = utility theory + Inference theory
   c. Decision Theory = utility theory + Uncertainty
   d. Decision Theory = preference + Probability theory

9. The primitives in probabilistic reasoning are random variables.
   a. True
   b. False

10. Which of the following is the negation of ∀x(P(x) → Q(x))?
   a. ∃x(P(x) →Q(x))
   b. ∃x(P(x) ∧¬ Q(x))
   c. ∃x(¬P(x)→¬Q(x))
   d. ∃x(¬ P(x) ∧Q(x))

CSPC-405 ARTIFICIAL INTELLIGENCE
ASSIGNMENT QUESTION BANK

Questions from the last unit:

Q 1. What is competitive learning, and how does it differ from supervised learning methods? Provide examples of real-world applications that benefit from competitive learning.

Q 2. Explain the following learning methods with respect to their role in the field of neural networks.

a. Hebbian Learning
b. Attractor networks

Q 3. How do inductive learning and Adaptive Resonance Theory address the balance between learning new information and retaining existing knowledge?

Rest of the questions:

Q 1. What are advantages and disadvantages of using semantic networks for knowledge representation over using first-order logic?

Q 2- Draw the semantic network that represents the data given below:

• Mammals have fur.
• All mammals are animals.
• A bird is an animal.
• A cat is a mammal.
• Tom is a cat.
• Tom is owned by John.
• Tom is ginger in colour

Q 3- What is a frame? Give examples

Q 4- Describe stages of the knowledge engineering process.

Q 5- Translate the following Propositional Logic to English sentences.

Let:

• E=Liron is eating
• H=Liron is hungry

(a) $E \Rightarrow \neg H$

Answer: If Liron is eating, then Liron is not hungry

(b) $E \wedge \neg H$

Answer: Liron is eating and not hungry

(c) $\neg(H \Rightarrow \neg E)$

Answer: Liron is hungry and eating

Q 6- Translate the following English sentences to Propositional Logic.

Propositions: (R)aining, Liron is (S)ick, Liron is (H)ungry, Liron is (HA)appy,
Liron owns a (C)at, Liron owns a (D)og

(a) It is raining if and only if Liron is sick

Answer: $R \Leftrightarrow S$

(b) If Liron is sick then it is raining, and vice versa

Answer: $(S \Rightarrow R) \wedge (R \Rightarrow S)$ (which is equivalent to $R \Leftrightarrow S$)

(c) It is raining is equivalent to Liron is sick

Answer: $R \Leftrightarrow S$

(d) Liron is hungry but happy

Answer: $H \wedge HA$

(e) Liron either owns a cat or a dog

Answer: (C ∧ ¬D) ∨ (¬C ∧ D)

Q 7- What are the advantages and disadvantages of hill climbing algorithm?

Q 8- Consider a graph where each node represents a city, and edges between cities have different costs associated with them (representing the distance between cities).

A) Explain the Best First Search (BFS) algorithm. How does BFS use a heuristic to determine the order in which nodes (cities) are expanded?
B) Given a graph of cities connected by roads, describe how the BFS algorithm can be modified to find the shortest path from a start city to a goal city when an admissible heuristic is used.
C) If BFS uses a greedy approach by selecting the node that appears closest to the goal (based on a heuristic), discuss the potential drawbacks or limitations of BFS compared to other search algorithms like Dijkstra's or A*. Provide an example scenario where BFS might fail to find the optimal path.

Q 9- Define a Constraint Satisfaction Problem (CSP). Explain the key components: variables, domains, and constraints, using an example like the map-coloring problem.

Q 10- Discuss how heuristics like the Minimum Remaining Values (MRV) and Least Constraining Value (LCV) can improve the efficiency of backtracking in solving CSPs. Provide an example scenario where these heuristics make a significant difference.

Q 11 - Differentiate between the following terms:

- Knowledge & Intelligence,
- Hypothesis & Belief
- AI Program & Conventional Program.

Q 12. a) Differentiate between strong AI and weak AI.

b) If the Turing Test is passed, does this show that computer exhibit intelligence? Justify!.

Q 13. *"AI has made a great progress in short History*".

Mention **briefly** the chronicle of AI through five generations (5Gs); 1950's a *gentle evolution* to Y2K a *raging revolution!.*

Q 14. a) What **separates** us Homo-Sapiens "Man the Wise" from Robo-Sapiens "Robot the wise"?

b) Who coined the word AI as opposed to "Computational Rationality", and when?

Q 15. Give an example of a problem for which Depth first search would work better than breadth first search.

Q 16. Determine whether Breadth first or Depth First search would be preferable for solving each of following problem. Justify your answer.

a) Diagnosing mechanical problems in automobile.

b) You have met a person who claims to be your distant cousin, with a common ancestor named Bill Gates. You would like to verify his claim.

Q 17. Give the initial state, goal state, successor function for each of the following.

a) **A 3-foot-tall monkey is in a room where some bananas are suspended from the 8 floor ceiling. He would like to get the bananas. The room contains two stackable, movable, climbable 3-foot-high crates.**

b) **You have 3 Jugs, measuring 12 gallons, 8 gallons and 3 gallons. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one gallon.**

Q 18. Describe in your own words why heuristics should be :

• useful

• admissible

• consistent

• monotone

Write a sentence each for the case what happens if a heuristic does not fulfil those facts.

Q 19. What is a good heuristic?

Q 20. Write difference between Best first search, A* and AO*.

Q 21. Write difference between blind search and informed search.

Q 22. How A* is used to solve 8 puzzle problem.

Q 23. Apply Constraint Satisfaction to solve the following crypt-arithmetic problem

SATURN+URANUS=PLANETS

Q 24. Let p, q, r denote the following propositions.

• p: Tom's house is red;

• q: Jim's house is red;

• r: Mary's house is red.

Translate the following statements into propositional logic:

1. Tom's house is red or Jim's house is red;

2. If Jim's house is red, then Tom's house is red and Mary's house is red;

3. Tom's house is not red;

4. Jim's house is red if, and only if, Tom's house is not red;

5. Neither Jim's nor Mary's house is red.

Q 25. Use truth tables to check which of the following propositional formulae are satisfiable:

• ¬ ¬p ∧ ¬(p ∨ q)

• ¬(¬p ∨ q) ∧ ¬r

• (p → q) ∧ ¬(q → p)

• (p → q) ∧ ¬(p → q)

• (¬(p ∧ q) ∧ p) ∧ q

Q 26. Write the predicates for the following sentences:

1. Mary loves everyone.
2. No one talks
3. Everyone loves himself.
4. Everyone loves everyone except himself.
5. Every student except George smiles.
6. Everyone walks or talks.
7. Every student walks or talks.
8. Every student who walks talks.
9. If a brick is on another brick, it is not on the table.
10. Every brick is on the table or on another brick.
11. No brick is on a brick which is also on a brick

Q 27. Prove the following using backward reasoning and resolution theorem:

1. Consider the following axioms:

All hounds howl at night.

Anyone who has any cats will not have any mice.

Light sleepers do not have anything which howls at night.

John has either a cat or a hound.

(Conclusion) If John is a light sleeper, then John does not have any mice.

2. Consider the following axioms:

Every child loves Santa.

Everyone who loves Santa loves any reindeer.

Rudolph is a reindeer, and Rudolph has a red nose.

Anything which has a red nose is weird or is a clown.

No reindeer is a clown.

Scrooge does not love anything which is weird.

(Conclusion) Scrooge is not a child.

3. Consider the following axioms:

Anyone who buys carrots by the bushel owns either a rabbit or a grocery store.

Every dog chases some rabbit.

Mary buys carrots by the bushel.

Anyone who owns a rabbit hates anything that chases any rabbit.

John owns a dog.

Someone who hates something owned by another person will not date that person.

(Conclusion) If Mary does not own a grocery store, she will not date John.

Q 28. Consider the following set of propositions:

Patient has spots

Patient has measles

Patient has high fever

Patient has Rocky Mountain Spotted Fever

Patient has previously been inoculated against measles

Patient has recently bitten by a tick

Patient has an allergy

a) For the above information create a network that defines the causal connections among these nodes.

Q 29. Write short notes on the following:

a. Robotics

b. Expert system

c. Natural Language Processing

d. Virtual Reality

Assignment question allotment sheet

Sr. No.	Roll No.	Student Name	Ques 4	Ques 5
1	21102028	GURNOOR CHHABRA	29	28
2	21102085	UTKARSH SANJEEV SOOD	26	15
3	21103001	ABHAY MISHRA	3	21
4	21103002	ABHISHEK KUMAR	23	7
5	21103003	ADITYA BHARTIYA	5	16
6	21103004	ADITYA PRATAP SINGH	22	9
7	21103005	AJAY KUMAR SAINI	7	17
8	21103006	AKSHAT SINGH RAGHUWANSHI	29	20
9	21103007	AKSHITA BANSAL	3	11
10	21103008	AKSHITA GOYAL	9	6
11	21103009	ALISHA	8	23
12	21103010	ALOK KUMAR VERMA	1	5
13	21103011	AMIT KUMAWAT	21	10
14	21103012	AMIT YADAV	17	13
15	21103013	AMRENDRA KUMAR	27	17
16	21103014	ANIKET AGRAHARI	23	2
17	21103015	ANISH KUMAR	26	10
18	21103016	ANJALI MEENA	20	4
19	21103017	ANKIT KUMAR	10	4
20	21103018	ANKIT SINGH CHAUHAN	28	10
21	21103019	ANKITA NEGI	25	4
22	21103020	ANNIE	12	29
23	21103021	ANSHDEEP SINGH	6	25
24	21103022	ANUBHAV KHERWA	25	7
25	21103023	ANURAG	7	12
26	21103024	ARMAN BAIG	22	18
27	21103025	ARPIT SALARIA	26	12
28	21103026	ARSHDEEP SINGH	7	15
29	21103027	ARSHIA SAREEN	17	14
30	21103028	ASHISH KUMAR SINGH	10	21
31	21103029	ASHUTOSH JHA	11	23
32	21103031	AVNEET SINGH SIDHU	25	1
33	21103032	AVNI AGGARWAL	19	14
34	21103033	AYUSH KUMAR SEHGAL	18	10
35	21103034	AYUSH RANJAN	17	8
36	21103035	AYUSHI	29	13
37	21103036	AYUSHI	5	2
38	21103037	BHAVEEN TIWARI	22	8
39	21103038	BHAVYA SHARMA	10	17
40	21103039	BHUVI PLAHA	2	28
41	21103040	CHANDAN KUMAR	10	23
42	21103041	CHANDAN SONI	3	3
43	21103042	CHENNURU VENKATA SAI KRISHNA REDDY	12	27
44	21103043	CHIRAG SHARMA	3	8
45	21103044	DEEPANSHU BANSAL	19	23
46	21103045	DIVI HARISH	19	15
47	21103046	DIVYAM	27	26
48	21103047	FARHAN AKHTAR	14	19
49	21103048	GAURAV PRATAP SINGH	1	29

Assignment question allotment sheet

50	21103049	GOURAV GOYAL	2	1
51	21103050	GUJJULA CHOLA NAGA SRI CHAITANYA REDDY	16	28
52	21103051	GURLEEN KAUR CHANNA	21	26
53	21103052	GURMAANDEEP SINGH	7	6
54	21103053	GURPARTAP SINGH	5	9
55	21103054	GURSHAANPREET SINGH	18	21
56	21103055	HARCHET SINGH	11	6
57	21103057	HARSH PATIL	5	19
58	21103059	HARSHIT ANAND	16	23
59	21103060	HARSHIT JAIN	13	23
60	21103061	HARSHITA KATARIA	2	10
61	21103062	HIMANSHU TIWARI	3	3
62	21103063	ISHITA SRIVASTAVA	13	12
63	21103064	JAGMAL RAM	7	16
64	21103065	JASHANPREET SINGH	28	4
65	21103066	JATIN GARG	25	13
66	21103067	JIGMET STANZIN DADUL	7	9
67	21103068	JITENDRA LOHANI	10	11
68	21103069	JIYA MITTAL	26	10
69	21103070	KAMALPREET KAUR	19	24
70	21103071	KAVISH SONI	23	3
71	21103072	KEERTI SINGH	3	6
72	21103073	KIRTAN GOHIL	14	22
73	21103074	KSHITIJ AGARWAL	7	27
74	21103075	KSHITIJ AGRAWAL	13	1
75	21103076	KSHITIJ SRIVASTAVA	28	20
76	21103077	KUNAL	12	29
77	21103078	KUNAL KUMAR	9	25
78	21103079	KUNDAN KUMAR	28	20
79	21103080	LAVISHA	10	1
80	21103081	LOKESH	18	3
81	21103082	MANAV BHAGAT	28	21
82	21103083	MANNAT AGGARWAL	7	22
83	21103084	MANU OJHA	1	24