UPES
End Semester Examination, December 2023

Course: Artificial Intelligence & Expert Systems   Semester   : 1st
Program: MTech (CSE)   Time   : 03 hrs.
Course Code: CSAI7003P   Max. Marks: 100

Instructions: Attempt all questions. Last question of Section B and C has an internal choice.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Give a brief history of Artificial Intelligence.	4	CO1
Q 2	What are the Limitations of propositional logic?	4	CO1
Q 3	Discuss various Elements of first-order logic.	4	CO2
Q 4	Which of the two following propositions are equivalent in the sense that one can always be substituted for the other one in any proposition without changing its truth value? Why? (a) first proposition: $P \Rightarrow Q$ second proposition: $\neg P \vee Q$	4	CO2
Q 5	Check the validity of the following implications (a) $P \rightarrow (Q \rightarrow R)$ equivalent to $(P \rightarrow Q) \rightarrow (P \rightarrow R)$	4	CO2

SECTION B
(4Qx10M= 40 Marks)

| Q 6 | Your roommate comes home; he/she is completely wet. You know the following things:

     — Your roommate is wet
     — If your roommate is wet, it is because of rain, sprinklers, or both
     — If your roommate is wet because of sprinklers, the sprinklers must be on
     — If your roommate is wet because of rain, your roommate must not be carrying the umbrella
     — The umbrella is not in the umbrella holder
     — If the umbrella is not in the umbrella holder, either you must be carrying the umbrella, or your roommate must be carrying the umbrella
     — You are not carrying the umbrella | 10 | CO3 |

	Can you conclude that the sprinklers are on? Can AI conclude that the sprinklers are on?		
Q 7	Translate each of the following sentences into First Order Logic (FOL): (a) **All that glitters is not gold** (b) **Not all that glitters is gold** (c) **There is a barber who shaves all men in the town who do not shave themselves** (d) **Every connected and circuit-free graph is a tree**	10	CO2
Q 8	Prove that $[(P \rightarrow Q) \vee (R \rightarrow S)] \rightarrow [(P \vee R) \rightarrow (Q \vee S)]$ is a contingency	10	CO3
Q 9	Discuss the architecture of Expert systems in detail by taking and one of the expert system as a typical case. **OR** 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 (b) If Liron is sick then it is raining, and vice versa (c) It is raining is equivalent to Liron is sick (d) Liron is hungry but happy	10	CO3/CO4
SECTION-C **(2Qx20M=40 Marks)**		
Q 10	What is back propagation in Artificial Neural Network? Discuss the role of a Bias in Artificial Neural Network. Draw the block diagram of a Multilayer Feed-Forward Neural Network. Discuss various steps in Back propagation Algorithm of an Artificial Neural Network.	20	CO4
Q 11	Take your own example for contrasting informed (BFS & DFS) and un-informed search (Greedy and A*) strategies of AI in terms of Time, Space complexities, completeness, and optimality. Give a concluding remark about which one would you prefer and why. **OR**	20	CO3

Draw the State space diagram **State-Space and state-space traversal using depth-first search and breath-first search:**

Exercise activity / machine	Coverage of different parts of the body	Time taken to burn 300 Cal (Minutes)	Recovery time after burning 300 Cal (Minutes)
0. Warmup activities	Full body	10	5
1. Skipping rope	Upper + Lower body	15	16
2. Exercise bike	Lower body	25	10
3. Tread Mill		20	12
4. Step Mill		16	14
5. Dumbbell	Upper body	12	9
6. Barbell		10	10
7. Cable-Crossover		10	8
8. Pulling bars	Upper + Middle body	6	10
9. Incline bench	Middle body (abdomen)	20	8
10. Leg press machine		11	8
11. Climbing rope	Upper + Middle + Lower body	10	5
12. Hammer strength	Upper body	8	4
13. Stretching	Full body	-	0