Unique Paper Code	:	**32341601**
Name of the Paper	:	**Artificial Intelligence**
Name of the Course	:	**B.Sc. (H) Computer Science**
Semester	:	**VI**
Duration of Examination	:	**Three Hours**
Maximum Marks	:	**75**

(For students admitted in 2015, 2016, 2017 & 2018)

Instructions for Candidates:

1. Attempt any **FOUR** questions.
2. Each question carries equal marks.

1. Give the Performance Measure, Environment, Actuators, and Sensors (PEAS) description for the *Automated Taxi Driver* environment. Differentiate between the following:

   - Fully observable vs. partially observable
   - Deterministic vs. stochastic
   - Episodic vs. sequential
   - Static vs. dynamic
   - Model-based agent and Goal-based agent
   - Goal-based agent and Utility-based agent

2. What are the differences between Recursive Transition Network (RTN) and Augmented Transition Network (ATN)? Draw the RTN to implement the grammar given below. Show the derivation of the sentence "**Mary slept on the sofa**" and also develop a parse tree using the following grammar:

S	→	NP VP
NP	→	N | DET N
VP	→	V | V PP
PP	→	PREP NP
N	→	Mary | sofa
V	→	slept
DET	→	the
PREP	→	on

3. Using the constraint satisfaction algorithm, solve the following cryptarithmetic problem:

$$\begin{array}{r} \quad B\ A\ S\ E \\ +\ B\ A\ L\ L \\ \hline G\ A\ M\ E\ S \\ \hline \end{array}$$

   Based on the solution of the above cryptarithmetic problem, find the value of B+L+A+M+E. Write a PROLOG program to implement GCD of two numbers.

4. Consider the following axioms:

   A1: Rajesh likes all kind of food.
   A2: Banana and Orange are food.
   A3: Anything anyone eats and not killed is food.
   A4: Madhav eats cashews and is still alive.
   A5: Anyone who is killed, is not alive.
   A6: Pankaj eats everything Madhav eats.

   Express the above axioms into First Order Predicate Logic (FOPL) statements and convert them into clausal form. Using resolution principle, prove that the statement "Rajesh likes cashews" is true.

   Transform the sentence $(\neg A \ \&\ B)\ V\ (A\ \&\ \neg B)\ \&\ C$ into Conjunctive Normal Form.

5. Differentiate between the monotonic reasoning and nonmonotonic reasoning. Give one example each of the monotonic and nonmonotonic reasoning.

   From experiments, it has been determined that $P(B|A) = 0.84$, $P(A) = 0.2$, and $P(B) = 0.34$. Find the probability $P(A|B)$ of the event A when it is known that some event B has already occurred. Describe how will you compute $P(A|\sim B)$ given only $P(A)$, $P(B|A)$, and $P(B)$?

   Draw the bayesian belief network for the given joint probability:
   $P(x_1, x_2, \ldots, x_7) = P(x_7|\, x_5, x_6)\, P(x_6|\, x_3, x_4)\, P(x_5|\, x_4)\, P(x_4|\, x_2)\, P(x_3|\, x_2)\, P(x_2|\, x_1)\, P(x_1)$

6. Give the similarities and differences between Best First Search and A* algorithm. Under what conditions A* algorithm provide an optimal solution?

   Consider the following game tree with ply depth 2 where the indicated scores are from the MIN player's point of view. Which move A should choose and why? Which nodes will be pruned according to the α-β pruning procedure? Give justifications of each.