Exam No: _____

GANPAT UNIVERSITY

B. TECH SEM-VI (CE/IT/CE-AI) REGULAR & REMEDIAL EXAMINATION–APRIL-JUNE 2023

2CEIT602: ARTIFICIAL INTELLIGENCE

TIME: 3 Hour **TOTAL MARKS: 60**

Instructions:
1) Figures to the right indicate full marks.
2) Be precise and to the point in your answer.
3) This Question paper has two sections. Attempt each section in a separate answer book.
4) The text just below marks indicates the Course Outcomes (CO)Numbers, followed by Bloom's taxonomy level of the question,
i.e., R: Remembering, U: Understanding, A: Applying, N: Analysing, E: Evaluating, C: Creating.

Section-I

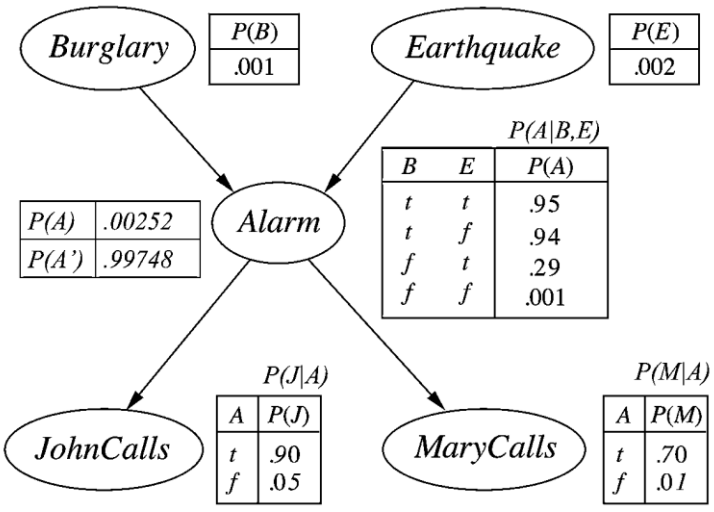
Q.1 [A] What is the Problem Formulation for measuring exactly 4 liters of water using two jugs, one with a capacity of 5 liters and another with a capacity of 3 liters, using the state space search method? Additionally, what is the minimum number of steps required to solve this problem, assuming that the jugs can be filled completely from a water source, emptied completely, and that pouring water from one jug to another count as one step? **[05] 3N**

Q.1 [B] Given the below knowledge base, show all steps of resolution to determine the answer to this query "What course would Meera like?". **[05] 3A**

1. Meera only likes easy courses.
2. Engineering courses are hard.
3. All the courses in the CE department are easy.
4. AI is a course in CE.

OR

Q.1 [A] In the Burglary Alarm, suppose the prior probabilities are given in the image below. What is the probability of a burglary given that John calls? In other words, what is P(Burglary|John Calls)? **[05] 3N**



Q.1 [B] What is meant by the term "Heuristic Function"? Provide two examples of such functions that could be used to solve the Block World problem. Then, solve the Block World problem using one of the heuristic functions, according to the following guidelines: **[05] 3A**

i. Choose at least five blocks and define the possible operations that can be performed on them.
ii. Define an initial state and a goal state for the problem.
iii. List all possible states that are used to solve the Block World problem.
iv. Compute heuristic values for all states of the Block World problem, using the chosen heuristic function.

Q.2 [A] Discuss any four applications of artificial intelligence in detail. **[05] 1U**

Q.2 [B] Create a Multilayer Perceptron model with one hidden layer and one output layer consisting of one perceptron to solve the XOR problem. Use the threshold activation function for both the hidden and output layers. Show the calculated output for all combinations of the two binary inputs. **[05] 2C**

OR

Q.2 [A] Discuss the difference between depth-first search and breadth-first search. **[05] 1U**

Q.2 [B] Write Python code for implementing a heuristic function for the 8-puzzle problem, assuming that the board is represented as a list of 9 elements where each element corresponds to a tile of the puzzle. The empty tile is represented by the number 0. **[05] 2C**

Q.3 [A] Write down all steps of the minimax game-playing algorithm. **[05] 3U**

Q.3 [B] Compare and contrast the MP Neuron and the Perceptron. In what ways are they similar and different? **[05] 1N**

Section-II

Q.4 [A]	What is a policy function? How do stationary and non-stationary policies differ from each other? Consider the example of a self-driving car and provide situations where each type of policy might be used.	**[05] 1A**
Q.4 [B]	What is the purpose of the sigmoid activation function in a neural network? How does it help to overcome the limitations of the step activation function used in Perceptron?	**[05] 3U**

OR

Q.4 [A]	Define the Markov decision process (MDP) and explain its all components by taking an example that can be modelled as an MDP.	**[05] 1A**
Q.4 [B]	What is the significance of the terminating criteria and fitness function in the Genetic Algorithm? Also, elaborate parameters used in Genetic Algorithm.	**[05] 3U**
Q.5 [A]	Define Reinforcement Learning by using an appropriate diagram and explain it in detail with the help of a given example "Teaching a dog a new trick by the trainer".	**[05] 4R**
Q.5 [B]	How do Q-functions work for the infinite horizon in Markov Decision Process (MDP)? How Q-function can be used to determine the optimal policy in MDP?	**[05] 4A**

OR

Q.5 [A]	Define the term agent in the context of reinforcement learning. Explain the agent by taking the example of a self-driving car as an agent. List out the types of an agent.	**[05] 4R**
Q.5 [B]	How does Fuzzy Logic work? Describe its application of membership functions, with specific reference to triangular and trapezoidal membership functions.	**[05] 4A**
Q.6 [A]	Draw and describe the architecture of the Rule-based Expert System.	**[05] 3R**
Q.6 [B]	Explain the concepts of Crossover and Mutation in Genetic Algorithm and provide an overview of three different crossover operations and one mutation operation.	**[05] 3U**

----------END OF PAPER----------