**Roll No. _____**

# KIET Group of Institutions

## CT Examination (2025-2026) ODD Semester

**Department: Computer Science** **Course: B.Tech.**
**Year: II** **Semester: III**
**Subject Name: AI And Its Application** **Subject Code: CS205B**
**Duration: 2 Hrs** **Max. Marks: 40**
**Note: Attempt all the questions of each section**

| **Section-A** | | | | **(1X10=10)** |
|---|---|---|---|---|
| **Q. 1** | | **Competitive Exam#** | **CO** | **BL/ KC*** |
| **a** | You're building a route planner for a delivery app. Under limited memory conditions, would you prefer DFS or BFS to explore delivery routes in a large city map? Justify your choice based on their characteristics. | | 1 | 2C |
| **b** | A robot is navigating an unknown maze. Initially, it has no information about the goal location but later gets a GPS hint about the direction. How would its search strategy change from uninformed to informed? Illustrate with examples of algorithms for each case. | | 1 | 2C |
| **c** | You are developing a class scheduler for a university. Each class must be scheduled in a room without time conflicts. Define the domains, constraints, and how consistency checking helps in avoiding schedule overlaps. | | 1 | 2C |
| **d** | You're designing a knowledge base for a smart assistant that should respond to queries like "All professors in the CS department are PhDs". Should you use propositional logic or first-order logic? Explain your choice with representation examples. | | 1 | 2C |
| **e** | A hiring system uses an AI-based model to screen applicants. What potential risks arise if the algorithm lacks transparency and fairness? How would you ensure fairness in such a model? | | 1 | 2C |
| **f** | Consider an AI-based stock trading agent. Explain how it would behave as a rational agent in a volatile market. Discuss the factors influencing its decision-making process. | | 2 | 1F |
| **g** | You're developing a smart home assistant that adjusts lighting, temperature, and security based on user preferences. Describe how this assistant qualifies as an intelligent agent. | | 2 | 1F |
| **h** | Imagine a self-driving car responding to red traffic lights. Would a reflex agent be sufficient? If the car also considers passenger comfort and fuel efficiency, how does a utility-based agent improve the decision-making? | | 2 | 2C |
| **i** | In a pricing strategy between two online sellers of the same product, each seller sets a price knowing the competitor might react. Model this scenario and identify a potential Nash Equilibrium. | | 2 | 1F |
| **j** | A warehouse robot must decide whether to pick up, deliver, or recharge based on battery level and task priority. Model this as a Markov Decision Process by identifying its states, actions, transition model, and reward function. | | 2 | 1F |
| **Section-B** | | | | **(4X4=16)** |
| **Q.** 2 | | | 1 | |

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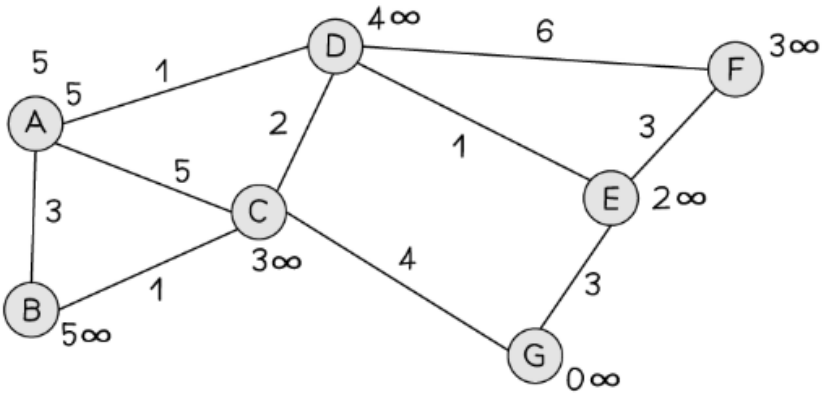
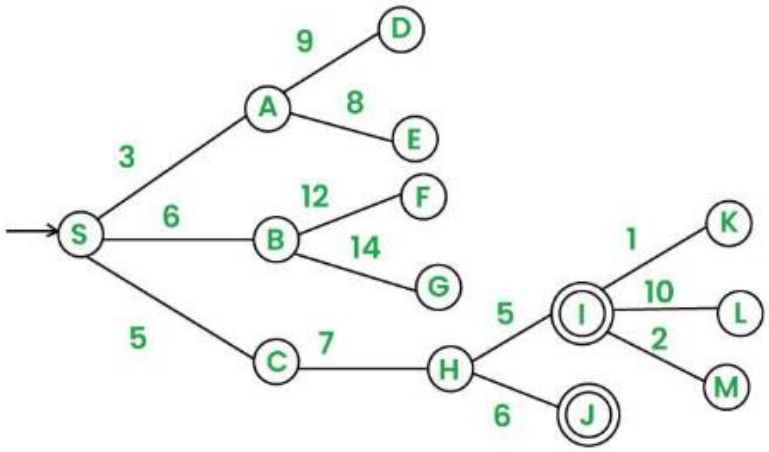
| | | | | |
|---|---|---|---|---|
| | Apply the A* algorithm on the given graph to find the shortest path. Here every node has 2 values the first value represents the h(x) and second value represent f(x)<br>  <br> | | | 3P |
| | OR | | | |
| | Apply the best first search algorithm on the following tree<br>  <br> | | | |
| **Q.** 3 | Demonstrate the Map Coloring Problem (with 4 regions) as a CSP by defining variables, domains, and constraints. | | 1 | 3P |
| | OR | | | |
| | Illustrate how forward checking would proceed in solving the 4-Queens problem | | | |
| **Q. 4** | Design a reflex agent for a smart vacuum cleaner that decides whether to clean, move, or stop based on dirt and obstacle sensors | | 2 | 2C |
| | OR | | | |
| | Given an agent that can perceive "light," "heat," and "sound," classify whether the environment is fully or partially observable and explain why. | | | |
| **Q. 5** | Apply a simple **Markov Decision Process (MDP)** to model a robot's movement through a 3-room layout with rewards and penalties. | | 2 | |
| | OR | | | |
| | Illustrate how collaborative robots in a warehouse represent a multi-agent system. | | | 3C |
| **Section-C** | | | | **(7X2=14)** |
| **Q. 6** | Apply a CSP model for university exam scheduling where: | | | |

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| | | | | |
|---|---|---|---|---|
| | 1. No student has overlapping exams,<br>2. Rooms have limited capacity,<br>3. Some exams require specific rooms (e.g., computer labs).<br>Justify your choice of variables, domains, and constraints, and discuss possible strategies to solve it efficiently. | | 1 | 3C |
| | OR | | | |
| | A reflex agent is deployed to solve a maze represented as a 2D grid, where:<br>1. S is the start point<br>2. G is the goal<br>3. 0 represents open paths<br>4. 1 represents walls<br>S 0 1 0 G<br>0 1 0 0 0<br>0 0 0 1 0<br>1 1 0 1 0<br>0 0 0 0 0<br>a. Represent the maze as a graph where each open cell is a node, and edges connect directly reachable neighbouring cells (up, down, left, right).<br>b. Apply Breadth-First Search (BFS) to find the shortest path from S to G, and list the order in which nodes are visited.<br>c. Mark the shortest path from S to G on the grid using an asterisk * for each step of the path. | | | |
| **Q. 7** | A vacuum cleaner operates in a 2×2 room grid as shown below:<br>A \| B<br>C \| D<br>Each cell can be clean or dirty. The vacuum starts in cell A.It can move left, right, up, down (if a move is possible). The current room status is: A Clean, B Dirty, C Dirty, and D is clean,<br>a. List all possible actions the vacuum can take in the first two steps, starting from A.<br>b. Propose a sequence of moves that will allow the vacuum to clean all dirty cells using the fewest number of moves.<br>c. Draw the final room state after your proposed path, labeling each step taken (e.g., A → B → clean → C → clean).<br>d. Explain how the vacuum cleaner can avoid unnecessary movement if it has memory of visited locations | | 2 | 2P |
| | OR | | | |
| | Solve the cryptarithm: CROSS+ROAD =DANGER<br>1 Define the variables involved.<br>2 State the domain for each variable.<br>3 List at least three constraints that must be satisfied.<br>4 Identify one possible solution that satisfies all constraints (if any).<br>5 Explain how a backtracking search or constraint propagation could be used to solve this. | | | |

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