Sample Question Format
(For all courses having end semester Full Mark=50)

KIIT Deemed to be University
Online End Semester Examination(Spring Semester-2021)

Subject Name & Code: Artificial Intelligence & CS 3011
Applicable to Courses: B. Tech IT

Full Marks=50 **Time:2 Hours**

SECTION-A(Answer All Questions. Each question carries 2 Marks)

Time:30 Minutes **(7×2=14 Marks)**

Question No	Question Type (MCQ/ SAT)	Question	CO Mapping	Answer Key (For MCQ Questions only)
Q.No:1	**SAT**	What are four approaches of Artificial Intelligence (AI)? Which one of these approaches is preferred most and why?	CO1	
	SAT	Out of four approaches of AI, why is Rational agent approach more justifiable than remaining three approaches?	CO1	
	SAT	What is the other name of Turing Test approach? Which six capabilities should be possessed by a system to qualify for Turing Test?	CO1	
	SAT	State at least five state of the art applications of AI.	CO1	
Q.No:2	**SAT**	State briefly about agent function, agent program, rational agent and performance measure.	CO2	
	SAT	Differentiate between rationality and omniscience. Which additional factors should be associated with a basic novice agent to become an autonomous rational agent?	CO2	
	SAT	Differentiate between a competitive multiagent and a cooperative multiagent through a suitable example.	CO2	
	SAT	Distinguish between environment class and environment generator.	CO2	
Q.No:3	**SAT**	Differentiate between two types of search: uninformed search and informed search. Mention the names of at least three search strategies for each type of search.	CO3	

	SAT	What are the five components of problem formulation? What are the input and output of any problem-solving agent algorithm, in general?	CO3	
	SAT	Distinguish between: i) State space and search tree ii) State and node.	CO3	
	SAT	Indicate both heuristic values (h1 = no. of misplaced tiles and h2 = Manhattan distance) given the following initial state and final state of 8-puzzle problem: (Only give the values. No calculation needs to be shown.)  Initial State  Final State	CO3	
Q.No:4	**SAT**	State three issues of Hill Climbing local search. Suggest briefly the solution to tackle each of these issues.	CO4	
	SAT	What is local search? Name four algorithms (including optimization) under local search.	CO4	
	SAT	If an 8-queens problem is to be solved using GA, then the corresponding fitness function to be maximized is "No. of nonattacking queen pairs". When the final solution will be achieved, this fitness function will have the maximum value. Then what is this maximum value? (Only write the answer. No calculation needs to be shown.)	CO4	
	SAT	Name at least three variants of Hill climbing approach?	CO4	
Q.No:5	**MCQ**	Which of the followings is an example of global constraint? A. k-consistent B. *Alldiff* C. x<0 D. x+y >=5	CO5	B
	MCQ	Adversarial search problems use A. Competitive Environment B. Cooperative Environment C. Neither Competitive nor Cooperative Environment D. Both Competitive and Cooperative Environment	CO5	A
	MCQ	In alpha-beta pruning, alpha is the A. the root node B. minimum value found so far C. leaf node	CO5	D

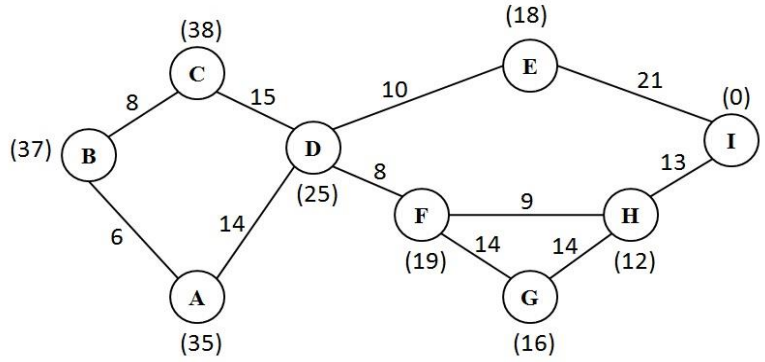
		D. maximum value found so far		
	MCQ	Consider a problem of job-shop scheduling in a car manufacturing factory. What type of problem is this? A. Search Problem B. Backtrack Problem C. CSP D. Planning Problem	CO5	C
Q.No:6	**MCQ**	Wumpus World is a best example of A. Adversarial search B. Reasoning with knowledge C. Constraint satisfaction problem D. Searching problem	CO6	B
	MCQ	Which algorithm will work backward from the goal to solve a problem? A. Forward chaining B. Backward chaining C. Depth First Search D. None of the mentioned	CO6	B
	MCQ	What is used in backward chaining algorithm? A. Conjuncts B. Substitution C. Composition of substitution D. None of the mentioned	CO6	C
	MCQ	What will backward chaining algorithm return? A. Additional statements B. Logical statement C. Substitutes matching the query D. All of the mentioned	CO6	C
Q.No:7	**MCQ**	Knowledge and reasoning play a crucial role in dealing with _____ environment. A. Completely Observable B. Partially Observable C. Neither Completely nor Partially Observable D. Both Completely and Partially Observable	CO6	B
	MCQ	Uncertainty arises in the Wumpus world because the agent's sensors give only A. Full & Global information B. Partial & Global Information C. Partial & local Information D. Full & local information	CO6	C
	MCQ	I) Knowledge base (KB) consists of set of sentences.	CO6	A

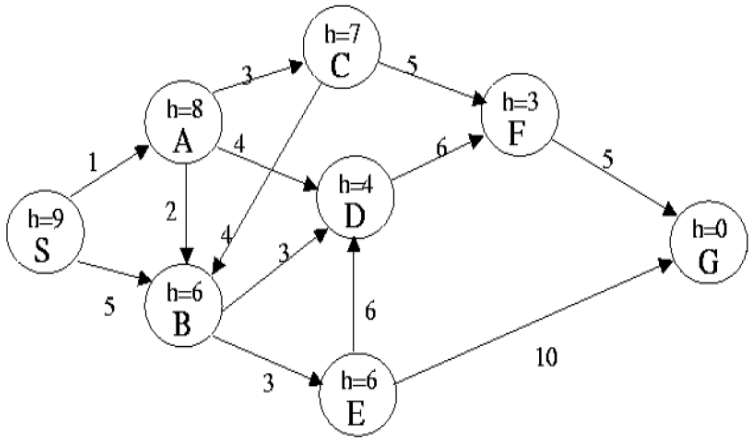
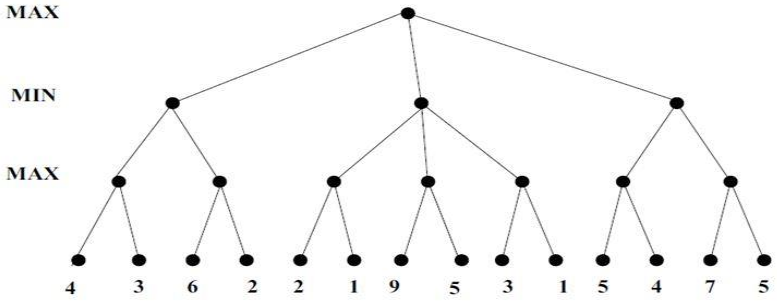
		II) Inference algorithm derives a new sentence from the KB. Choose the correct option: A. I is true, II is true B. I is false, II is false C. I is true, II is false D. I is false, II is true		
	MCQ	Inference algorithm is complete only if _____ a) It can derive any sentence. b) It can derive any sentence that is entailed. c) It derives only entailed sentences. d) It can derive some entailed sentences	CO6	B

SECTION-B(Answer Any Three Questions. Each Question carries 12 Marks)

Time: 1 Hour and 30 Minutes **(3×12=36 Marks)**

Question No	Question	CO Mapping (Each question should be from the same CO(s))
Q.No:8	What are task environment and PEAS description? Specify the task environments in a tabular manner for the following agents through their respective PEAS descriptions: i) Automated taxi driver ii) Medical diagnosis system iii) Part-picking robot iv) Satellite image analysis system Explain briefly six types of properties of task environments. State these properties of task environments in a tabular manner for the following agents: i) Chess with a clock ii) Refinery controller iii) Interactive English tutor iv) Mars rover	CO2
	Why is the table-driven approach to agent construction a failure? State four popular design types of agent architecture. Draw the schematic diagram and briefly explain each of these	

	design types. Draw the schematic diagram of a learning agent indicating its four conceptual components.	
	Explain the difference between a goal-based agent and a utility-based agent through examples and schematic diagrams. Draw the block schematic diagram of a learning agent and explain its four conceptual components through suitable examples.	
Q.No:9	In A* search, define the admissible heuristic and consistent heuristic. How do these two heuristics are associated with the optimality of A* search? Consider the search problem below with start state A and goal state I. The transition costs (or step costs) are next to the edges, and the heuristic values are indicated within round brackets very close to the states. Apply A* search to expand the nodes systematically by drawing the corresponding tree diagrams. Find the order of expansion of nodes from start state to goal state.  	CO3
	Under which condition, Depth first search fails? Explain how Depth limited search (DLS) takes care of this issue of DFS. What is the major drawback of DLS? Finally explain how Iterative deepening search (IDS) solves the issues of DFS and DLS and also combines the benefits of both DFS and Breadth first search (BFS)? Show in a tabular manner the comparative performance measures of six uninformed search strategies, such as, BFS, UCS, DFS, DLS, IDS and BDS.	
	Justify why the time & space complexities of Bidirectional search (BDS) being implemented from both ends using BFS are considerably less than those of Breadth first search (BFS) being implemented only from initial end, for the given initial state and goal state. Find the order of expansion of nodes for the following search graph using i) Uniform cost search (UCS) ii) Greedy best first search Assume start node to be S and goal node to be G. The values indicated along the connecting lines represent step costs or transition costs and values indicated inside the nodes represent heuristic values.	

		
Q.No:10	Write the concept of Alpha-Beta pruning. Why is it preferred over Minimax search? What do the parameters Alpha and Beta mean? Solve the following example and show how alpha-beta pruning helps in pruning the search tree. 	CO5
	Define Constraint Satisfaction Problem (CSP) along with its components. Explain briefly three types of constraints in CSP. Solve the following Cryptarithmetic problem, properly defining its variables, domains and constraints involved: (Each letter represents a distinct integer value from 0 to 9 and there must not be any leading zeroes) B A S E + B A L L --- G A M E S Draw the constraint hypergraph of the same.	
	Explain how to formally define a problem using constraint satisfaction problem? Provide the constraint propagation and backtracking process in relation to map coloring problem.	
Q.No:11	What is Logical Agent? What are its properties? Give the PEAS representation and characteristic features for "Wumpus world" problem. Take an example and explain how a logical agent can solve the problem.	CO6

	Explain the knowledge-based agent for a partially observable environment. How is it different from a problem-solving agent? Explain entailment and inference with examples. What do you understand by soundness and completeness in inference mechanism?	
	Explain propositional logic and first order logic with respective syntax and semantics. Compare and contrast both representations with examples. Mention the components of a Planning Domain Definition Language (PDDL) with examples.	