B. COMPUTER SCIENCE AND ENGINEERING EXAMINATION, 2023

(3rd YEAR, 2nd SEMESTER, SUPPLEMENTARY)

ARTIFICIAL INTELLIGENCE

Time: Three Hours **Full Marks: 100**

Answer any Five Questions

Different parts of a question must be answered together

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1. (a) What is 'Artificial Intelligence'? Discuss on Turing test in connection to intelligence of a machine. What is an agent? Compare between 'Rule based reflex agent' and 'Reactive and memory agent'. 3+4+3+4

   (b) Discuss on the performance measuring indices to evaluate any search strategy. 6

2. (a) What is 'State Space Graph'? 4

   (b) Derive space and time complexity of iterative deepening search (IDS). 6

   (c) Consider the 3-puzzle problem shown in Fig. below:
   Possible operators (in order) are: up, down, left, right. Assume that **repeated states are not detected.**
   Draw search tree using BFS. Would DFS find the goal? How many nodes would be generated if IDS is used starting with depth increment of one? 10

2	3
1	

Initial state

1	2
3	

Final state

3. (a) Why heuristics are used in search methods? 4

   (b) What is admissible heuristic function? 4

   (c) If h1(s) and h2(s) are both admissible heuristic functions, is h3(s) = |h1(s)-h2(s)| admissible? – Justify. 4

(d) Can A* search more nodes than greedy search? Provide example in support of your answer. 4

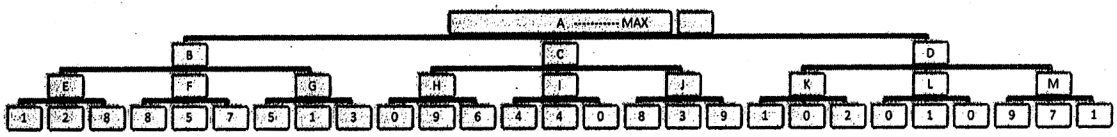
(e) Justify- "BFS is a special case of A*". 4

4. (a) Discuss about MINIMAX procedure. 4

(b) Define alpha-cut off and beta-cut off. 4

(c) In game playing program, we use "static" scores. Why such scores are called "static"? 4

(d) Consider the following game tree in which static scores are all from first player's point of view. Which should be his best first move? Which branches will be pruned if α-β pruning algorithm is used? (The static scores at the leaf nodes from left to right are as follows: 1, 2, 8, 8, 5, 7, 5, 1, 3, 0, 9, 6, 4, 4, 0, 8, 3, 9, 1, 0, 2, 0 1, 0, 9, 7, 1) 8



5. (a) Discuss on the disadvantages of Hill climbing process. 5

(b) How do you draw the correspondence between simulated annealing algorithm and optimization process? 5

(c) Discuss on crossover and mutation operators used in GA. 6

(d) Explain how GAs differ from conventional mathematical methods for optimization. 4

6. (a) Why do we require 'unification'?
Find the *mgu* of the following: {P(x,z,y), P(w,u,w), P(A,u,u)} 2+4

(b) Convert the following *wff* into clause form. 6
$(\forall x)\{ P(x) \rightarrow [\sim(\forall y)\{Q(x,y) \rightarrow P(f(z))\} \wedge (\forall y)\{Q(x,y) \rightarrow P(x)\}] \}$

(c) Consider the following facts:
"Anyone passing his or her artificial intelligence (AI) exam and winning the lottery is happy. But anyone who studies or is lucky can pass all his exams. Pete did not study but is lucky. Anyone who is lucky wins the lottery."
Use resolution to answer: "Is Pete happy?". 8

7. (a) When do we call a reasoning system a "non-monotonic" one? 4

(b) What type of information (about a 'node') you can obtain by looking at the SL- justification part. Discuss. 4

(c) Define fuzzy set. Write down the differences between crisp set and fuzzy set. 3+5

(d) Model 'Old' man using suitable membership function. Then graphically represent 'very Old'. 4

8. (a) Discuss on AND-OR Graph and its applicability to Game playing Program. 8

(b) Write short note on Bidirectional BFS and island driven search. 8

(c) Comment on "Fuzzy set is a generalization of conventional set theory". 4