

B. COMPUTER SCIENCE AND ENGINEERING EXAMINATION, 2017

(4TH YEAR, 1ST SEMESTER, SUPPLEMENTARY)

ARTIFICIAL INTELLIGENCE

Time: Three Hours

Full Marks: 100

Answer any Five Questions

1. (a) What is 'AI'? Discuss on Turing Test in connection to intelligence of a machine. Discuss on the concept of "Systems that act rationally". What is a rational agent? . 3+4+4+3
- (b) Discuss on the performance measuring indices to evaluate any search strategy. 6

2. (a) How do you formalize a search strategy? Discuss on "order" and "path" in connection to a search strategy. 3+5
- (b) Derive space and time complexity of iterative deepening search (IDS). 8
- (c) Draw the relation among DFS, DLS and IDS. 4

3. (a) How do you say that BFS and DFS are special cases of Best first search? 4
- (b) If $h_1(s)$ and $h_2(s)$ are both admissible heuristic functions, is $h_3(s) = |h_1(s)-h_2(s)|$ admissible? – Justify. 3
- (c) Is optimality affected if the heuristic is inadmissible in greedy search? -- Discuss 3
- (d) 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 (so, repetition may occur)**.
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

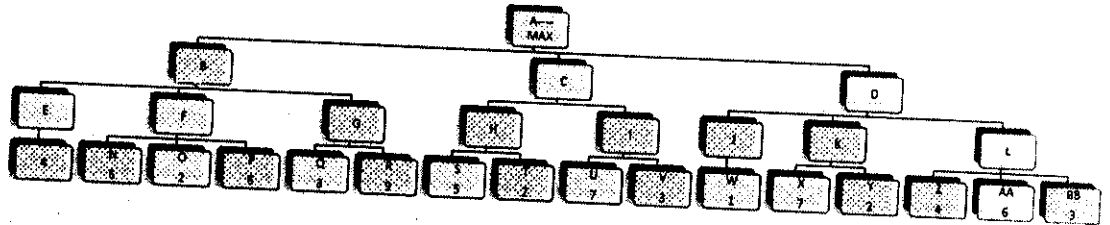
2	3
1	

Initial state

1	2
3	

Final state

4. (a) Justify- "A* algorithm is a combination of past and future". 4
- (b) Discuss about MINIMAX procedure. 4
- (c) Define alpha-cut off and beta-cut off. 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: 4 6 2 6 3 9 5 2 7 3 1 7 2 4 6 3) 8



5. (a) Discuss on the drawbacks of hill climbing process. 6
- (b) Write down simulated annealing algorithm. 6
- (c) Discuss on Roulette Wheel Selection process in GA. 4
- (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.
 $(\forall x)\{P(x) \rightarrow [(\forall y)\{Q(x,y) \rightarrow P(f(z))\} \wedge (\forall y)\{\sim Q(x,y) \rightarrow P(x)\}]\}$ 6
- (c) Consider the following axioms:
1. Zebras are mammals, striped and medium size.
 2. Mammals are animals and warm-blooded.
 3. Striped things are non-solid and non-spotted. Things of medium size are neither small nor large.
- Use resolution to answer: If Zeko is a zebra, is Zeko non-large? 8

7. (a) When do we call a reasoning system a "non-monotonic" one? 4
- (b) What are the components of non-monotonic reasoning system? Discuss on "dependency directed backtracking". 2+4
- (c) Define fuzzy set. How do you change a subnormal fuzzy set into a normal one? 3+3
- (d) Give an example of fuzzy set that will be modelled using triangular membership function. 4
8. (a) Discuss on usage of "AND-OR Graph" for two-person Game playing Strategies. 8
- (b) Write short note on Bidirectional BFS and island driven search. 8
- (c) Comment on the performance of IDA* search process. 4
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