B. COMPUTER SCIENCE AND ENGINEERING EXAMINATION, 2018

(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 the intelligence of a machine. What is an agent? Discuss on 'Utility based agent'. 3+4+3+4

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

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

   (b) Compare BFS, DFS and IDS with respect to computation time requirement (find out the ratio in terms of branching factor, *b* and depth value, *d)* . 4

   (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) Write down the advantages and disadvantages of use of heuristics in search technique? 4

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

   (c) Let h1 and h2 be two admissible heuristic functions used for solving a certain problem. Which one is better between h1 & h2 and why? 4

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

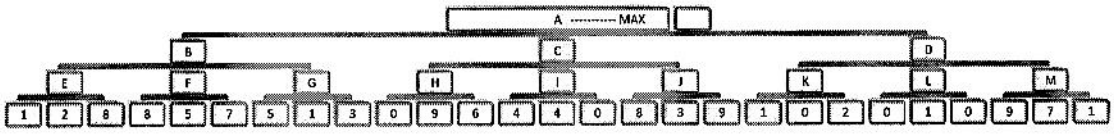
   (e) Justify- "BFS is a special case of A*". 4

4. (a) Discuss on 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 (mentioning the problems, and methods to overcome those, if exist etc.). 6

   (b) Draw one-to-one correspondence between simulated annealing algorithm and optimization process? 5

   (c) Discuss on steps of crossover operation in GA. 5

   (d) Discuss on the pros and cons of mutation operator used in GA . 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:
   Every child loves Santa.
   Everyone who loves Santa loves any reindeer.
   Rudolph is a reindeer, Rudolph has a red nose.
   Anything which has a red nose is weird or is a clown.
   No reindeer is a clown.
   John does not love anything that is weird.

   ---Prove that "John is not a child" using resolution. 8