**Answer any three out of four questions.**

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| 1. | a) What are the components of the problem space of a search algorithm?  b) If there are two heuristics h1 and h2 for a problem, then in which case h1 will perform better than h2? Explain your answer. `  c) What is the difference between hill climbing and simulated annealing search? Explain the purpose of the temperature variable in simulated annealing. How effective would the method be without it? | 3  5  7 |
| 2. | a) Briefly describe the 2-opt mutation for travelling salesman problems.  b) For backtracking search mention at least three heuristics to improve the search. Explain with examples.  c) Show the steps that would be taken in running the Minimax algorithm on the game tree shown below. The root node is the MAX node. Now run through the same tree using alpha–beta pruning. How do the two compare?  minimax.jpg | 2  6  7 |
| 3. | a) What two requirements should a problem satisfy in order to be suitable for solving it by a GA?  b) Suppose you have an admissible heuristic h. Is h2 admissible? Is √h admissible? Would using any of these alternatives be better or worse than using h in the A ∗ algorithm? Assume the value of h is integer.  c) A genetic algorithm is to be used to evolve a binary string of length *n* containing only 1s. The initial population is a randomly generated set of binary strings of length n.   1. Give a suitable fitness function for this problem. 2. Will the offspring of parents with a high fitness value generally also have a high fitness value, given your fitness function? Explain your answer.   c) Briefly explain the resolution inference rule. | 3  4    2  3  3 |
| 4. | a) Though iterative deepening search seems highly wasteful but actually it is not that much wasteful. Explain your answer.  b) In propositional logic explain the differences between forward chaining and backward chaining algorithm.  c) What is model checking? Explain with an example. | 5  6  4 |