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

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| 1. | a) What is min-conflicts heuristic in n-queens problem. Explain with an example.  b) Briefly describe model checking as an enumeration method for propositional logic.  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) For which type of problem you prefer to apply local search algorithms?  b) What two requirements should a problem satisfy in order to be suitable for solving it by a GA?  c) What is the difference between unit resolution and full resolution inference rules?  d) 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?  minmax.gif | 3  3  3  6 |
| 3. | a) What is horn clause? Why is it important?  b) In what cases hill climbing algorithm stuck into local maxima? How you can avoid local maxima.  c) Suppose a genetic algorithm uses chromosomes of the form *x = abcdefgh* with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as:  f(x) = (a + b) − (c + d) + (e + f) − (g + h) ,  and let the initial population consist of four individuals with the following chromosomes:  x1 = 6 5 4 1 3 5 3 2  x2 = 8 7 1 2 6 6 0 1  x3 = 2 3 9 2 1 2 8 5  x4 = 4 1 8 5 2 0 9 4   1. Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last. 2. Perform the following cross-over operation: Cross the second and third fittest individuals using a two–point crossover (points b and f). 3. Evaluate the fitness of the new population. Has the overall fitness improved? | 3  5    2  3  2 |
| 4. | a) In propositional logic show that the following hypotheses:  *It is not sunny this afternoon and it is colder than yesterday.*  *We will go swimming only if it is sunny.*  *If we do not go swimming, then we will take a canoe trip.*  *If we take a canoe trip, then we will be home by sunset.*  lead to the conclusion:  ***We will be home by the sunset.***   1. Translate the statements into propositional logic. 2. Write a formal proof, a sequence of steps that state hypotheses or apply inference rules to previous steps   b) For the following graph color the nodes using three colors R, G, B. Use LCV and MRV to color the graph. Show all the intermediate steps with explanation. | 3  5  7 |

