

Class Test
Artificial Intelligence

Total Marks: 10 Time: 25 minutes

Q1. (a) A fitness landscape contains multiple local maxima, flat plateaus, and one global maximum. A local search agent begins at a state X , which has three neighbors:

- N_1 : higher value than X
- N_2 : lower value than X
- N_3 : equal value to X (a plateau)

Using your understanding of *hill climbing*, *stochastic hill climbing*, and *simulated annealing*:

- 1) Describe how each algorithm behaves when starting at X .
- 2) Identify which of these algorithms may escape a plateau or local maximum, and explain why.
- 3) Explain how the *shape* of the fitness landscape influences algorithm behaviour beyond the raw numerical values.

[5 marks]

Q1. (b) A factory must assign five tasks $\{A, B, C, D, E\}$ to three machines $\{M1, M2, M3\}$ subject to:

- Tasks A and B cannot run on the same machine.
 - Task C must be completed before task D .
 - Machine $M3$ cannot process task E .
 - No machine may process more than 2 tasks.
- 1) Formulate this scenario as a *Constraint Satisfaction Problem (CSP)* by specifying variables, domains, and constraints.
 - 2) Explain whether local search for CSPs (e.g., *min-conflicts*) is appropriate for this problem and describe when it performs well.

[5 marks]

— *End of Test* —