AI Foundations & Applications (AI61005)
Class Test 1
September 6, 2021

Question Paper has THREE Parts. This is PART A – the first part

Time 20 Minutes
Answer All Questions

Write your name and roll number on every sheet.
Try to use one page to answer one full question – total of 2 pages only for this part
Combine the sheets into a single pdf and upload using the Google Form provided.

1. Consider a state space graph for a **minimization problem** where the edge costs are positive and heuristic estimates are non-negative and monotonic. All f(n) values are distinct in the sense that there are no nodes having identical f(n) values. Now answer each of the following with True or false responses and provide a justification (with a proof sketch or example as needed)

   a. If the heuristics are not guaranteed to be underestimates, algorithm A* may not give the optimal solution always.

   b. If the heuristics are not guaranteed to be underestimates, Algorithm A* and Algorithm IDA* may yield different solutions.

   c. The first solution of DFBB may be the optimal one in some cases

   d. If the heuristics are underestimates, DFBB may expand fewer nodes compared to IDA* if we count re-expansions.

   e. All nodes expanded by A* need not be expanded by IDA*

   [10 marks. 1 mark for answer, 1 mark for justification]

2.
   a. Present in details (in a step-wise manner) the A* heuristic search algorithm for solving **Maximization Problems**.

   b. Clearly **highlight which steps are different** from the version of the algorithm used for solving minimization problems and where the differences lie.

   c. Also **state the assumptions on heuristic estimates** for algorithm A* to guarantee optimal solutions for maximization problems.

   [4+2+2 = 8 marks]