

Department of Computer Science and Engineering
Bangladesh University of Engineering and Technology
CSE 6403: Final Exam
Full Marks: 40, Time: 1:30 hour

Answer all questions.

- Q1.** a) Write “T” for true and “F” for false for each of the following statements. 5
- An *in-place* planar convex hull algorithm takes memory to store the input points and an additional $O(1)$ memory for working space.
 - A cube is 5-equiprojective.
 - Dual of a triangulation produced by Graham’s scan is Hamiltonian.
 - Lower bound of comparison based sorting is at most $O(n)$ since the Jordan sorting can be done in linear time.
 - Power diagram is a variation of polygon triangulation.
- b) Prove an $O(n \log n)$ lower bound of computing the convex hull in 2D. Why does this lower bound also hold in 3D? 5
- Q2.** Describe Chan’s output-sensitive algorithm for computing the convex hull in 2D. Also derive the time complexity. 10
- Q3.** a) Prove that the dual of a triangulation of a simple polygon without any hole is a tree. 5
- b) Explain with an example that for a simple polygon with n vertices, $\lfloor n/3 \rfloor$ cameras are sometimes necessary to guard the polygon. 5
- Q4.** a) Prove that the size of a Voronoi diagram is linear? 5
- b) Explain the relation between convex hull in 3D and Delaunay triangulation in 2D? How can you use this relation to find an algorithm for computing the Delaunay triangulation in 2D? 5