Babu Banarasi Das National Institute of Technology & Management, Lucknow. **Department of Computer Science & Engineering**

Computational Geometry IInd Sessional Test 2011-12 (ECS042)

CSE Final Year

MM:30 TT:1.5 H

Note: Attempt all questions, each question carry equal marks.

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| **Q1. Attempt any Three Parts: (5X3)** |
| 1. Define Voronoi Diagram. Prove this lemma: The only way in which a new arc can appear on the beach line is through a site event. |
| 1. Discuss the Plane Sweep Algorithm VORONOIDIAGRAM(P), in detail, also discuss its time complexity. |
| Prove the following:  1. Theorem: Every simple polygon admits a triangulation, and any triangulation of a simple polygon with n vertices consists of exactly n−2 triangles. 2. Art Gallery Theorem: For a simple polygon with n vertices, n/3 cameras are occasionally necessary and always sufficient to have every point in the polygon visible from at least one of the cameras. |
| Discuss Partitioning a Polygon into Monotone Pieces and Triangulating a Monotone Polygon. |
| Discuss Delayney triangulations, with its relation to voronoi diagrams and convex hulls. |

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| **Q2. Attempt any Three Parts: (5X3)** |
| (a) Discuss “Arrangements of Lines as Geometric Structure”; Also calculate the cost of adding a line to a set of Lines. |
| (b)Prove Theorem (Zone Theorem): Let M be any set of m lines in the plane. For any line S  M, the size of the zone of S in H(M) is O(m). In other words, the total face-length of all faces in H(M) intersecting S is O(m). |
| (c) Discuss Trapezoidal Decompositions in range queries. |
| (d) Given a set N of half-spaces, construct the facial lattice of the convex polytope formed by them. |
| Discuss arrangements of hyper planes. |

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