School of Mathematical and Computational Sciences

Indian Association for the Cultivation of Science

Master's/Integrated Master's-PhD Program/ Integrated Bachelor's-Master's Program/PhD Course

Theory of Computation II: COM 5108

Tutorial VIII (12 November 2025)

Instructor: Goutam Biswas *Autumn Semester 2025*

Definition 1. $dHAMPATH = \{< G, s, d >: G$ is a directed graph with a Hamiltonian path from s to $d\}$.

Exercise 1. $dHAMPATH$ is **NP**-*complete*.

Exercise 2. The language of undirected Hamiltonian path (uHAMPATH) is defined as follows.

$uHAMPATH = \{< G, s, d >: G$ is an undirected graph and there is a Hamiltonian path from s to $d\}$.

(i) Show that uHAMPATH $\in$ **NP**.

(ii) Show that uHAMPATH is **NP**- hard.

Exercise 3. Give a polynomial time reduction of 3COL to SAT. What is the time complexity of the reduction.