**Bangladesh Army University of Engineering & Technology (BAUET)**



**Department of Computer Science and Engineering (CSE)**

**2nd Year 2nd Semester Sessional Class, Fall-2024**

**Course Code: CSE-2211**

**Course Title: Data Structure and Algorithms-II Sessional**

**Complex Engineering Problem**

**"EcoNet — Building a Sustainable Smart City Network"**

In the futuristic city of **EcoNet**, engineers are building a **smart infrastructure** to connect various **smart stations** (energy hubs, water stations, IoT control centers, etc.). The mayor wants this system to be efficient and **eco-friendly**, minimizing both **construction cost** and **energy usage**. However, due to terrain and environmental constraints, some paths are more expensive or less sustainable.

You, as the **chief algorithm designer**, are given a map of potential connections between stations, each with:

* A **construction cost**
* An **environmental impact score** (lower is better)

Your task is to choose a subset of connections such that:

1. **All stations are connected** (i.e., the network forms a single connected structure),
2. The **total cost is minimized**, and
3. The **total environmental impact is within a sustainable threshold** T.

If such a network is **not possible**, return "IMPOSSIBLE".

### **Input Format:**

* First line: n m T — number of stations, number of connections, environmental impact threshold
* Next m lines: u v c e — a possible connection between stations u and v with construction cost c and environmental impact e

### **Output Format:**

* If possible: print the **minimum cost** of connecting all stations within the impact threshold
* Otherwise: print IMPOSSIBLE

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| Test Case | Sample Input | Sample Output |
| 1 | 4 5 15  1 2 4 5  1 3 3 6  2 3 2 3  3 4 5 2  1 4 10 10 | 11 |
| 2 | 3 3 5  1 2 3 4  2 3 2 3  1 3 4 2 | IMPOSSIBLE |
| 3 | 4 5 10  1 2 3 3  2 3 3 3  3 4 3 3  4 1 3 3  1 3 4 4 | 9 |
| 4 | 2 1 10  1 2 7 5 | 7 |

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| **CO** | : CO1, CO2, CO3, CO4, CO5 |

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| **PO** | : PO2 (problem analysis), PO4 (investigation), PO5 (tool usage), PO6 (sustainability & society) |

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| **KP** | : WK5 (environmental impact), WK7 (societal responsibility), WK8 (research evaluation) |

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| **WP** | : WP1 (requires in-depth algorithm knowledge), WP2 (balancing cost & impact) |

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| **EA** | : EA1 (resource optimization), EA3 (innovative solutions), EA4 (societal/environmental consequences) |