Advanced Algorithms
UE20CS311

Assignment 1: Research paper reading, summarization

Main Paper: Reducibility Among Combinatorial Problems
https://cgi.di.uoa.gr/~sgk/teaching/grad/handouts/karp.pdf

Introduction
The goal of this assignment is to introduce you to research paper reading and summarization—technical writing for describing mathematical concepts, an important skill to have for writing reports and papers in the domain of algorithms.

Assignment
Submit a report explaining each of the following topics in *your own words*. Do not copy directly from any source, including textbooks, and **strictly avoid plagiarism**. Keep it brief according to the specified marks.

1. Turing machines (1 mark), the complexity classes **P** and **NP** (1 mark), and **NP-completeness** (1 mark).
2. SAT, and how to prove NP-completeness by reduction to SAT. (2 marks)
3. Any of the following problems (choose **exactly one**) and prove that it is NP-complete (5 marks).
    a. Register Allocation
    b. Multiprocessor Scheduling
    c. Chromatic Numbering

Register Allocation: https://en.wikipedia.org/wiki/Register_allocation
Multiprocessor Scheduling: https://en.wikipedia.org/wiki/Identical-machines_scheduling
Chromatic Number: [Covered in the Karp paper linked above]

NOTE: This assignment will be scaled down to a total of 2 marks in the final evaluation scheme.

Plagiarism in any form will not be tolerated. All work submitted is assumed to be original.

Hints/Tips

— You will be scored on your ability to understand and communicate highly technical, mathematical research. As a result, try not to make assumptions about the scientific literacy of the reader, and present your arguments as clearly as possible.
— Do not exceed three pages in length. There is no minimum word count, but as a good rule of thumb, about one paragraph for each topic (with the exception of the NP-completeness proof) should be good enough.

Submission Details

Submit your work at this link (https://forms.gle/wYhrCHhDw3U6gkqQ6) before **26th August, 2022, 11.59 PM**.

Late submission will be until **29th August, 2022, 11.59 PM** for a penalty of one mark a day of delay.

Upload your reports as a PDF file, named according to your SRN as follows: **PES1UG20CSXXX_A1.pdf**

Doubts

You can clarify all your doubts on the WhatsApp group, or send an email to **advancedalgos2022@gmail.com**.