BITS Pilani
Pilani | Dubai | Goa | Hyderabad

Work Integrated Learning Programmes Division
M.Tech (Data Science and Engineering)

(S1-19_DSECLZG519)
(Data Structures and Algorithms Design)
Academic Year 2019-2020

Assignment 2 – PS4 - [Assignment Problem] - [Weightage 13%]

1. Problem Statement

As part of dissertation, the University professor has decided to ask the students about their preferences of topic before assigning the problem statements to each one of them. The topics available are:

1. Data mining
2. NLP
3. AI
4. Spatial Data Analysis
5. Image processing
6. Big-Data
7. Graph Mining
8. Machine Learning
9. E-commerce
10. Wireless Mobile communication
11. Cloud computing

There are 11 students working with the Professor. Each student can have more than 1 topic which he/she prefers. Your job is to help the professor calculate the number of unique allocation of topics to the students such that everybody gets exactly one topic of their liking and no two students get the same subject allocated.

Requirements:

1. Formulate an efficient algorithm using dynamic programming to perform the above task.
2. Analyse the time complexity of your algorithm.
3. Implement the above problem statement using Python 3.7

Input:

Input should be taken in through a file called “inputPS4.txt” which has the fixed format mentioned below using the “/” as a field separator: Student <num> / < topic 1> / <topic 2> / <topic 3>….

Ex:

S1 / DM / SDA / WMC / CC

S2 / DM / NLP / AI / SDA / IP / GM / EC

S3 / DM / SDA / GM / ML / WMC

S4 / DM / AI / SDA / IP / GM / ML / WMC / CC

S5 / NLP / AI / SDA / BD / EC / WMC / CC

S6 / DM / NLP / AI / BD

S7 / IP / GM / CC

S8 / DM / AI / SDA / CC

S9 / AI / IP / BD / WMC / CC

S10 / DM / NLP / AI / GM / EC / CC

S11 / DM / IP / BD / GM / ML

Note that the input data shown here is only for understanding and testing, the actual file used for evaluation will be different.

Output:

Syntax of the output should be:

The total number of allocations possible is: <number of possible combinations of allocations>

Ex: The total number of allocations possible is: 7588.

Display the output in **outputPS4.txt**.

2. Deliverables

- Word document **designPS4_<group id>.docx** detailing your algorithm design and time complexity of the algorithm.

- **Zipped AS2_PS4_AP_[Group id].py package folder** containing all the modules classes and functions and the main body of the program.
- **inputPS4.txt** file used for testing
- **outputPS4.txt** file generated while testing

1. Instructions

a. It is compulsory to make use of the data structures or algorithm mentioned in the problem statement.

b. It is compulsory to use Python 3.7 for implementation.

c. Ensure that all data structures and functions throw appropriate messages when their capacity is empty or full.

d. For the purposes of testing, you may implement some functions to print the data structures or other test data. But all such functions must be commented before submission.

e. Make sure that your read, understand, and follow all the instructions

f. Ensure that the input, prompt and output file guidelines are adhered to. Deviations from the mentioned formats will not be entertained.

g. The input, prompt and output samples shown here are only a representation of the syntax to be used. Actual files used to test the submissions will be different. Hence, do not hard code any values into the code.

h. Run time analysis is provided in asymptotic notations and not timestamp based runtimes in sec or milliseconds.

2. Deadline

a. The strict deadline for submission of the assignment is 16th Feb, 2020.

b. The deadline is set for a month from the date of rollout to accommodate for the semester exams. No further extension of the deadline will be entertained.

c. Late submissions will not be evaluated.

3. How to submit

a. This is a group assignment.

b. Each group has to make one submission (only one, no resubmission) of solutions.

c. Each group should zip the deliverables and name the zipped file as below

“ASSIGNMENT2_[BLR/HYD/DLH/PUN/CHE]_[G1/G2/…].zip” and upload in CANVAS in respective location under ASSIGNMENT Tab.

d. Assignment submitted via means other than through CANVAS will not be graded.

4. Evaluation

a. The assignment carries 13 Marks.

b. Grading will depend on

   a. Fully executable code with all functionality

   b. Well-structured and commented code

   c. Accuracy of the run time analysis and design document

c. Every bug in the functionality will have negative marking.

d. Source code files which contain compilation errors will get at most 25% of the value of that question.

5. Readings

Text book: Algorithms Design: Foundations, Analysis and Internet Examples Michael T. Goodrich, Roberto Tamassia, 2006, Wiley (Students Edition). Chapters: 5.3