School of Computer Science & Engineering

VIT, Vellore

CSI2003: Advanced Algorithms

FAT Lab Test G2 slot

Faculty: Dr. Lakshmanan K   Winter 2020-21   Date of Exam: 02/06/2021

Instructions: 1. There are 2 questions and all need to be answered.

2. Program should be written in C/C++ only.

3. The program and the sample output (possibly with the screenshot image if time permits) should be uploaded as a single pdf file in VTOP before the lab hour ends. Late submissions will be summarily rejected.

4. Store the file name to be Reg.No._FAT_AdvAlgo

Q1. Given a multiset of positive integers (multiset is a set where elements can be repeated) whose cardinality is divisible by 3, partition the given set into triplets (i.e., three elements for a set) such that sum of the elements of each partition is the same as the others (i.e., all partitions are having equal sum). Note that every element of the multiset must be used exactly once in a partition. For a given multiset of positive integers (ask the user to provide the input and check whether it meets the initial condition), write a program using backtracking method to find the solution for this problem (Hint: divide the elements into triplets, check the total with the total of another triplet set. If equal, check with another and continue. If not equal for two triplet sets, redo the partition).

Example: Multiset is {20,23,25,30,45,45,27,30,30,40,22,23}. Partition 1 is {20,25,45}, Partition II is {23,27,40}, Partition III is {45,23,22} and Partition IV is {30,30,30} such that each Partition total sum is 90.

Q2. Given a graph, consider a property for a subset V' of V: no two vertices of V' are adjacent. The questions to you are the following: (i) Given a graph (say in adjacency matrix) and subset V', write a program that checks this property is hold for V' or not. (ii) Write a program that proposes an approximation algorithm and outputs V' with the above property. [Hint: see how this problem is connected to vertex cover and do the change in the approximate algorithm for vertex cover].

Example: Consider the following graph. Consider the red vertices set (or even the blue vertices set). They satisfy the above mentioned property (no two red/blue vertices share an edge) and both are of size 4.