Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam - 603 110
(An Autonomous Institution, Affiliated to Anna University, Chennai)

UCS2403: DESIGN & ANALYSIS OF ALGORITHMS

Assignment 10 - CAT 2 Revision

1. Write a Python code to implement the following sorting algorithms:
   (a) Insertion sort
   (b) Bubble sort
   (c) Selection sort
   (d) Merge sort
   (e) Quick sort

2. Give a dynamic programming algorithm to solve the following problem. There is a flight of stairs with n steps in total. A girl climbing these stairs can take either one step at a time or two steps at a time. In how many number of ways can she climb the stairs? Implement the algorithm using Python.

3. Write a Python code to implement the following Greedy algorithms:
   - Dijkstra's algorithm
   - Prim's algorithm
   - Kruskal's algorithm

4. In Domino Solitaire, you have a grid with two rows and many columns. Each square in the grid contains an integer. You are given a supply of rectangular 2×1 tiles, each of which exactly covers two adjacent squares of the grid. You have to place tiles to cover all the squares in the grid such that each tile covers two squares and no pair of tiles overlap. The score for a tile is the difference between the bigger and the smaller number that are covered by the tile. The aim of the game is to maximize the sum of the scores of all the tiles. See the figure for an example of a grid, along with two different tilings and their scores. The score for Tiling 1 is

$12 = (9-8) + (6-2) + (7-1) + (3-2)$ while the score for Tiling 2 is $6 = (8-6) + (9-7) + (3-2) + (2-1)$. There are other tilings possible for this grid, but you can check that Tiling 1 has the maximum score among all tilings. Your task is to write a Python code that reads the grid of numbers and computes the maximum score that can be achieved by any tiling of the grid. (Source: Indian National Olympiad in Informatics, 2008)