# BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI,
# K. K. BIRLA Goa Campus,
# I SEMESTER 2021 – 2022
# Advanced Operating Systems (CS G623)
# Assignment 3, Due date: 31/10/2021 (11:59 P.M)
# Marks: 18M [6%]

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*Instructions: Please upload your completed assignment in Quanta.*
*This is an individual assignment. Please see section 4b of handout for Malpractice regulations.*
*The programming assignments will be graded according to the following criteria*

- *Completeness; does your program implement the whole assignment?*
- *Correctness; does your program provide the right output?*
- *Efficiency; have you chosen appropriate algorithms and data structures for the problem?*
- *Programming style (including documentation and program organization); is the program well designed and easy to understand?*
- *Individual Viva.*

Submit your assignment as a tar.gz file.
*DO NOT FORGET to submit a README file (text only) with following contents.*

***General README instructions***

1. *Your name. If you interacted significantly with others, indicate this as well.*
2. *A list of all files in the directory and a short description of each.*
3. *HOW TO COMPILE your program (You need to submit MAKEFILE for each question).*
4. *HOW TO USE (execute) your program.*
5. *A description of the structure of your program.*
6. *In case you have not completed the assignment, you should mention in significant detail:*
    a. *What you have and have not done,*
    b. *Why you did not manage to complete your assignment (e.g., greatest difficulties)*
7. *This will allow us to give you partial credit for the things you have completed.*
8. *Document any bugs in your program that you know of. Run-time errors will cost you less penalty if you document them and you show that you know their cause. Also describe what you would have done to correct them, if you had more time to work on your project.*

*NB: Late submission will not be entertained.*

## Question #1 PREMIER LEAGUE

**Problem Statement:**

It is the premier league season and you have to simulate the league to find out the champions. The league comprises N football teams (N<=10), numbered 1 to N. There are total N stadiums (indexed 1 to N) and each stadium has a stadium manager. The $i^{th}$ stadium is the home ground of the $i^{th}$ team.

Each team plays 2 games against every other team - One at its home ground and one away (home ground of opponent team).

If a team wins a match, it gets 3 points. If it's a draw, both teams get 1 point. If a team loses, they won't get any points.

At the end of the season, the team with the maximum points wins the premier league title. If some teams finish with the same number of points, their position in the League table is determined by the number of goals scored. If the teams have the same number of points and number of goals scored, then the team with lower team index gets a higher position.

You are provided the league fixture in an input file. Each line of input consists of the ids of the teams playing the match. (Refer input format) Your task is to schedule each match and notify the manager of the stadium on which the match is to be played. Each Match goes on for 3s. The goals scored by both teams can be generated randomly. Assume no team can score more than 5 goals in a match. At the end of the match, the stadium manager updates the score of the teams.

More than one match can be played simultaneously, but note that if team A is playing against team B then it cannot play against team C at the same time. If a match is ongoing at the stadium i, then a match cannot be scheduled at the same stadium at the same time.

Your task is to schedule and simulate the matches according to the fixture given. Consider each stadium manager as a process. All the stadium manager processes must be created before the matches start and each process must remain alive until all the matches to be played at the corresponding stadium are completed.

Display the final result of the league in the decreasing order of the points scored by each team (Refer the sample output)

**Input Format:**

First line contains N - Number of teams

Followed by N*(N-1) lines of the form i j, which denotes match Team i Vs Team j, played at the home ground of $i^{th}$ team.

**Sample Input #1:**

```
3
1 2
2 3
3 1
2 1
3 2
1 3
```

**Sample Input #2:**

```
4
1 2
2 1
4 1
1 3
2 4
2 3
3 2
4 3
4 2
3 1
1 4
3 4
```

**Sample Output #1:**

```
Starting match: Team 1 vs Team 2
Match ended: Team 1 vs Team 2    Result:4-1
Starting match: Team 2 vs Team 3
Match ended: Team 2 vs Team 3    Result:4-0
Starting match: Team 3 vs Team 1
Match ended: Team 3 vs Team 1    Result:2-0
Starting match: Team 2 vs Team 1
Match ended: Team 2 vs Team 1    Result:4-2
Starting match: Team 3 vs Team 2
Match ended: Team 3 vs Team 2    Result:1-2
Starting match: Team 1 vs Team 3
Match ended: Team 1 vs Team 3    Result:0-4

Team    W       D       L       GS      Points
-----------------------------------------------------
2       3       0       1       11      9
3       2       0       2       7       6
1       1       0       3       6       3
```

NOTE:

W- No of matches won

D- No of matches drawn

L- No of matches lost

GS- Total goals scored in the league

**Sample Output #2:**

```
Starting match: Team 1 vs Team 2
Match ended: Team 1 vs Team 2    Result:0-2
Starting match: Team 2 vs Team 1
Match ended: Team 2 vs Team 1    Result:2-2
Starting match: Team 4 vs Team 1
Match ended: Team 4 vs Team 1    Result:3-3
Starting match: Team 1 vs Team 3
Starting match: Team 2 vs Team 4
Match ended: Team 1 vs Team 3    Result:3-4
Match ended: Team 2 vs Team 4    Result:3-4
Starting match: Team 2 vs Team 3
Match ended: Team 2 vs Team 3    Result:0-0
Starting match: Team 3 vs Team 2
Match ended: Team 3 vs Team 2    Result:2-1
Starting match: Team 4 vs Team 3
Match ended: Team 4 vs Team 3    Result:4-2
Starting match: Team 4 vs Team 2
Starting match: Team 3 vs Team 1
Match ended: Team 4 vs Team 2    Result:0-0
Match ended: Team 3 vs Team 1    Result:0-0
Starting match: Team 1 vs Team 4
Match ended: Team 1 vs Team 4    Result:3-2
Starting match: Team 3 vs Team 4
Match ended: Team 3 vs Team 4    Result:3-3

Team    W       D       L       GS      Points
-----------------------------------------------------
4       2       3       1       16      9
3       2       3       1       11      9
1       1       3       2       11      6
2       1       3       2       8       6
```