

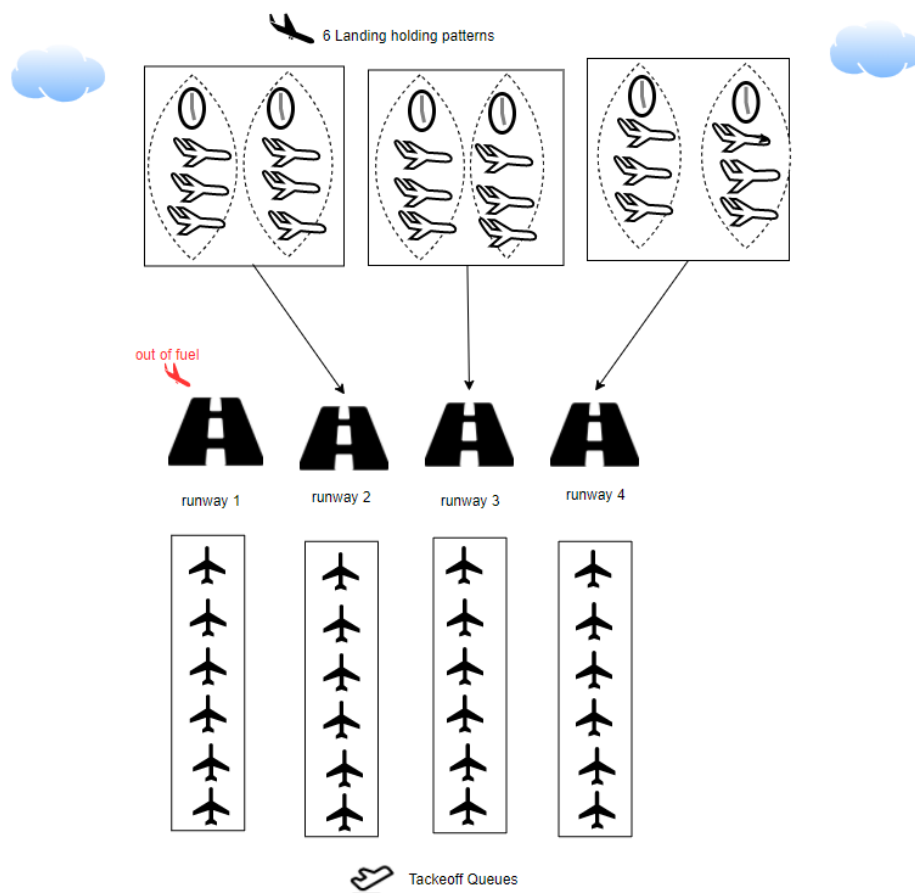
Program Assignment 1

Data Structures and Object-oriented Programming

Instructor: Feng-Jian Wang

Due: **28th, March 2022**

In this assignment, you are required to write a program to simulate an airport landing and takeoff pattern. The airport has four runways, runway 1, runway 2, runway 3 and runway 4. There are six landing holding patterns, two for each of the last three runways. Arriving planes will enter one of the holding pattern queues, where the queues are to be as close in size as possible. When a plane enters a holding queue, it is assigned an integer *id* number and an integer giving the number of time units the plane can remain in the queue before it must land (because of low fuel level). There is also a queue for takeoffs for each of the four runways. Planes arriving in a takeoff queue are also assigned an integer *id*. The takeoff queues should be kept appropriately the same size.



At each time, up to four planes may arrive at the landing queues and up to three planes may arrive at the takeoff queues. Each runway can handle on takeoff or landing at each time slot. Runway 1 is to be used for takeoff except when a plane is low on fuel. At each time unit, planes in either landing queue whose airtime has reached zero must be given priority over other landings and takeoffs. If only one plane is in this category, runway 1 is to be used. If more than one, then the other runways are also used (at each time, at most four planes can be serviced in this way).

Use successive even (odd) integers for *id*'s of planes arriving at the takeoff (landing) queues. At each time unit assume that arriving planes are entered into queues before takeoffs or landings occur. Try to design your algorithm so that neither landing nor takeoff queues grow excessively. However, the arriving planes must be placed at the ends of queues. Queues cannot be reordered.

The output should clearly indicate what occurs at each time unit. Periodically output (a) the contents of which queue; (b) the average takeoff waiting time; (c) the average landing waiting time; (d) the average flying time remaining on landing; and (e) the number of planes landing with no fuel reserved. (b) and (c) are for planes that have taken off or landed, respectively. The output should be self-explanatory and easy to understand (and unclutter).

The input can be from a terminal, a file, or it can be generated by a random number generator. For each time unit the input consists of the number of planes arriving at take-off queues, the number of planes arriving at landing queues, and the remaining flying times for each plane arriving at a landing queue.