International Software Engineering Program
International College
King Mongkut's Institute of Technology Ladkrabang

13006101 **Introduction to Computers and Programming**

Final Examination

Instruction

1. This is a **closed book** exam, any book or document is **not allowed** to bring into the room.
2. There are **6** questions, please **answer all** of them.
3. Anyone found **guilty** due to cheating of the exam, will be given **"F" grade** for this course.

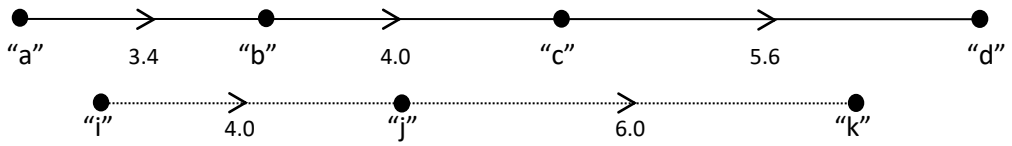
Questions:

1. (5 marks) Write a Python function **find_member_positions(number,list_of_numbers)** to find all positions where **number** is in the list **list_of_numbers**. That is, the function returns a list of all positions of the number in the list; if **number** is not in the list, the function returns 0.

   For example, **find_member_positions(2,[2,5,3,2,4])** → [0,3].
   find_member_positions(1,[2,5,3,2,4]) → 0.

2. (5 marks) Define a Python function **find_route** to find a route formed by connecting some directed paths, each of which connects from one node to another. Given a start node of a route and a dictionary, whose rows store directed paths with their lengths (measured in centimeters), the function traverses from the start node through each connected path and forms the route until it reaches the end of the route, the function then returns the route (represented by a list of nodes connected by the paths) and its distance.

   For example, the two routes below can be constructed from some directed paths stored in the dictionary **routes** below.



   Dictionary **routes**:

Key	Value
"i"	("j",4.0)
"a"	("b",3.4)
"j"	("k",6.0)
"c"	("d",5.6)
"b"	("c",4.0)
…	…

   So **find_route**("a",routes) → (["a","b","c","d"], 13.0).
   find_route("b",routes) → (["b","c","d"], 9.6).

3. (5 marks) From **Question 2**, define a **recursive** function **find_route_distance** to calculate a distance of a route when given its start node. That is, given a start node and a dictionary as given in **Question 2**, the function **find_route_distance** traverses from the start node through each connected path along the route recursively until it reaches the end of the route, while calculating the distance of the route.

   So **find_route_distance("a",routes)** → 13.0.
   find_route_distance ("b",routes) → 9.6.

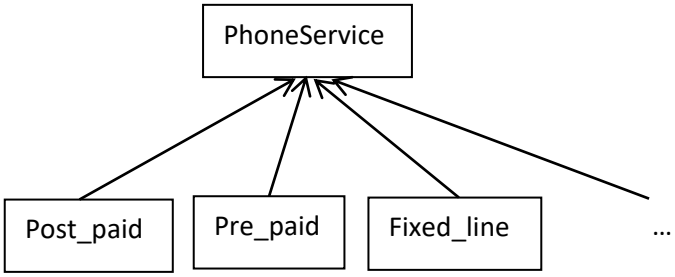
4. (5 marks) Define a class **EWallet** which a person can use to keep his/her (electronic) money. The owner can put money into and take money out from the e-wallet. For each e-wallet, it must have an owner and maximum money amount the wallet can keep. The owner can check the current money amount in his/her wallet any time.

5. (5 marks) From Question **4** define a class **SmartEWallet** as a sub-class of **EWallet**. The class **SmartEWallet** is different from its super class as follows:

    1. an object of **SmartEWallet** stores sequentially historical activities of putting money in and taking money out from this smart e-wallet,
    2. the owner can set the maximum money amount for every taking out of money from his/her wallet,
    3. the owner can view all of the historical activities stated in 1.

6. (5 marks) Write a Python program using **polymorphism** to calculate cost of a telephone service. **PhoneService** is an *abstract* class whose *concrete* classes are **Post_paid**, **Pre_paid**, **Fixed_line**, and so on. PhoneService has **three** properties: **phone_no**, **cutomer_name**, and **mm-yyyy** (a month of service).

    For each phone service cost, a post-paid service is charged with a fixed cost if the call duration does not exceed the monthly allowance (the time limit), any extra minute will be charged with 1 Baht per minute. A pre-paid service will be charged with 2 Bahts per minute. A fixed-line service will be charged with 3 Bahts per local call.



    Define classes **Post_paid**, **Pre_paid**, and **Fixed_line**; and write a **main program** to calculate the phone service cost for Johnny English, the summary of his telephone usage is shown below. For each concrete class, define method **find_cost()** to calculate cost for each type of phone service.

    Month: 09-2021
    Customer: John English

    Post-paid service tel no: 081-000-0007
    Monthly fix cost: 800 Bahts gives 1,000 minutes monthly allowance
    Call duration of this month: 1,250 minutes

    Pre-paid service tel no: 080-000-0007
    Call duration of this month: 100 minutes.

    Fixed-line service tel no: 02-000-0007
    No. of local calls: 200
