University of Khenchela
Faculty of sciences Technologies   L1 ST
Final Exam (Solution) : Computer science 1
Exam's duration :1H30   Date : January 22, 2025
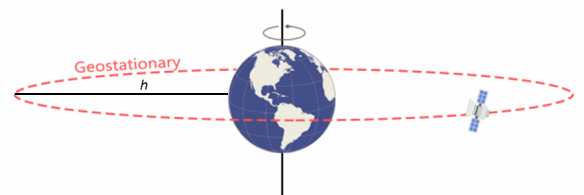Dr. Hichem RAHAB

1 Exercise (07 points)

A satellite is to be launched into a circular orbit around the Earth so that it orbits the planet once every T seconds. The altitude h above the Earth's surface that the satellite must have is :

$$h = \left(\frac{GMT^2}{4\pi^2}\right)^{1/3} - R$$

$G = 6.67 \times 10^{-11} m^3 kg^{-1} s^{-2}$ is Newton's gravitational constant, $M = 5.97 \times 10^{24}$ kg is the mass of the Earth, and R = 6371 km is its radius.

1. Analyse the problem giving its inputs and outputs.

2. Describe the solution method.

3. Write a program that asks the user to enter the desired value of T and then calculates and prints out the correct altitude in meters.

1.1 Solution (07 points)

1. Problem analysis :

Inputs : T   (01 point)
Outputs : h   (01 point)
Resolution method : $h = \left(\frac{GMT^2}{4\pi^2}\right)^{1/3} - R$ (01 point)
3. Python program :   (04 point)

```python
from math import pi
T = float(input('Enter T:'))#86400
G = 6.67 * 10**(-11)
M = 5.97 * 10**(24)
R = 6371 * 10**3

h = ((G * M * T**2)/(4 * pi **2 ))**(1/3) - R
print('h = ', h ,'m, or', h/1000 ,'km')
```

2 Exercise (06 points)

Write a python program to classify a solution as acidic, basic, or neutral based on its pH. Then, check if it is hot or cold based on its temperature.

1. pH < 7 : Acidic	2. pH == 7 : Neutral	3. pH > 7 : Basic
Temp > 50 C : Hot Acid		Temp > 50 C : Hot Base
Temp ≤ 50 C : Cold Acid		Temp ≤ 50 C : Cold Base

2.1 Solution (06 points)

```python
pH = float(input("Enter the pH value: "))
temperature = float(input("Enter the temperature (C): "))

if pH < 7:
  if temperature > 50:
    print("The solution is a Hot Acid.")
  else:
    print("The solution is a Cold Acid.")
elif pH > 7:
  if temperature > 50:
    print("The solution is a Hot Base.")
  else:
    print("The solution is a Cold Base.")
else:
  print("The solution is Neutral.")
```

3   Exercise (07 points)

Write a Python program to calculate the price of a museum ticket based on the users age, the membership on the museum (True/False) and if they are visiting during peak hours (True/False).

1. Children (under 18 years old) :
   — If the visitor is a museum member, the ticket price is $ 5.
   — If the visitor is not a member, the ticket price is $ 7.

2. Adults (between 18 and 60 years old) :
   — If the visitor is a museum member :
      — During peak hours, the ticket price is $ 10.
      — During off-peak hours, the ticket price is $ 8.
   — If the visitor is not a member :
      — During peak hours, the ticket price is $ 15.
      — During off-peak hours, the ticket price is $ 12.

3. Seniors (over 60 years old) :
   — If the visitor is a museum member, the ticket price is $ 6.
   — If the visitor is not a member, the ticket price is $ 8.

3.1 Solution (07 points)

```python
age = int(input("Enter your age: "))
membership = input("Are you a member (yes/no)? ")
time_of_visit = input("Are you visiting during peak hours (yes/no)? ")
if age < 18:
  if membership == "yes":
    price = 5
  else:
    price = 7
elif 18 <= age <= 60:
  if membership == "yes":
    if time_of_visit == "yes":
      price = 10
    else:
      price = 8
  else:
    if time_of_visit == "yes":
      price = 15
    else:
      price = 12
else:   # Seniors (age > 60)
```

```python
    if membership == "yes":
        price = 6
    else:
        price = 8

print("The ticket price for you is :", price)
```

Good Luck

```python
    if membership == "yes":
        price = 6
    else:
        price = 8

print("The ticket price for you is :", price)
```