OOP TEST 3

Question 1

Choose the correct statement about “abstract class” in C++:

a. We can create an object from abstract class.
b. We cannot create an object from abstract class.
c. We cannot inherit from abstract class.
d. Both b and c are correct.

Question 2

Explain the difference between overloading and overriding in C++:

Question 3

```cpp
#include <iostream>
#include <cstring>

struct Base {
  Base(const char *s) { m_str = strdup(s); }
  Base(const Base &b) { m_str = strdup(b.m_str); }
  ~Base() {
    std::cout << "~" << m_str << "\n";
    delete []m_str;
  }
  Base & operator =(const Base &b) {
    std::cout << m_str << " = " << b.m_str << "\n";
    Base tmp(b);
    std::swap(m_str, tmp.m_str);
    return *this;
  }
private:
  char *m_str;
};

struct Derive: public Base {
  Derive(const char *s): Base(s) {}
};
int main() {
  Derive d1("hello");
  Derive d2("world");
  d1 = d1;          // Assign to itself.
  d2 = d1;
}
```

a. What does the above program print to the screen?
b. Does the above program have memory leak problem? Explain why or why not.

Question 3

xFTech is a sport technology company. To prepare for FIFA Worldcup 2022, xFTech is planning to develop a program for managing football teams. Each football team has a name, a year of establishment, the main head-quarter's address, and the name of the team's home stadium. Each team has many players. The information of each player consists of a name, a date of birth, a gender, and a list of roles that the player is able to play.

In total, there are 8 roles of player: Goalkeeper (GK), Centre Back (CB), Left Back (LB), Right Back (RB), Central Midfielder (CM), Left Midfielder (LM), Right Midfielder (RM) and Striker (ST). A player is able to play more than one role on the field but has only one primary role. For example, Messi can play as a ST or a CM, even sometimes as a LM or RM but his primary role is ST.

Each role has a name and a base salary per minute. The base salaries per minute of the roles are as follow:

Role	Base salary per minute
GK	300
CB	520
LB	500
RB	500
CM	580
LM	500
RM	500
ST	600

The playing time at each role of a player are also recored.

The salary a player get at each role (role salary) is determined by the following formulas:

- For primary role, role salary = role playing time * role base salary per minute * 1.2.
- For additional role, role salary = role playing time * role base salary per minute.

The total salary of a player = sum of role salaries.

A C++ program does the followings:

- Enter from keyboard a football team, its players and their roles.
- Calculate the amount of money the team pays its players.

Apply encapsulations, inheritance and polymorphism in object oriented programming to do the followings:

a. Draw UML class diagram for the above program.

b. Implement the program based on class diagram in a).