University College Dublin
An Coláiste Ollscoile, Baile Átha Cliath

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# SEMESTER 2 EXAMINATION – 2011/2012

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## COMP 20080

## Computer Science for Engineers II

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**Time allowed: 2 hours**

### Instructions for candidates

Answer ALL questions. Question 1 is worth 40 marks. All other questions are worth 3 marks each.

Write your answers in the Answer Books provided.

### Instructions for invigilators

Loose Rough Work sheets are not to be distributed or used.

Use of calculators is prohibited.

**1.** ***[40 marks: 20 marks for (a), 20 marks for (b)]***

Consider the following contained in a C++ file **`Account.h`**:

```
class Account
{
  private:
  int accountNumber;
  float accountBalance;

  public:
  Account(int num, float bal);
  int withdraw(float amount);
  void deposit(float amount);
  int getNumber();
  float getBalance();
};
```

(a) Implement the above methods in another C++ file **`Account.cpp`** according to the following specifications:

i. The constructor **`Account()`** sets up an object of the class **`Account`** with the given account number and initial account balance.
ii. The method **`withdraw()`** takes as input the amount to be withdrawn from the account. The method returns **`0`** if there is not enough money in the account to cover the withdrawal, and returns **`1`** if the withdrawal is successful; the account balance is unchanged if the withdrawal cannot be completed. *You may assume that the input* **`amount`** *is non-negative*.
iii. The method **`deposit()`** takes as input the amount to be added to the account balance. *You may assume that the input* **`amount`** *is non-negative*.
iv. The method **`getNumber()`** returns the account number.
v. The method **`getBalance()`** returns the account balance.

(b) Write a C++ program which declares an object of the class **`Account`** *(details up to you)*, deposits some cash, withdraws an amount less than the balance, and then attempts to withdraw an amount greater than the balance. After each operation, the program should report the account number, current account balance, and (if the previous operation was a withdrawal) an indication as to whether the operation was successful or not.

***Questions 2–21 are worth 3 marks each***

2. Which of the following statements are true about an **Abstract Data Type** (ADT)? *(choose all that apply)*

(a) An ADT consists of a data structure, and functions that access and modify that structure.

(b) An ADT is a fundamental component of the functional abstraction approach.

(c) When implemented in C++, each ADT used in an application is usually written in a separate source file.

(d) When implemented in C++, all ADTs used in an application must be written in a single source file.

3. **True** or **False** *(no explanation required)* – a C++ programmer can define more than one constructor with the same argument list for a class, provided the constructors' names are different.

4. In C++, a **method** differs from a function in C or C++ in the following ways: *(choose all that apply)*

(a) A method cannot be called directly, but must have the class name and `::` placed immediately before the method's name.

(b) A method cannot be called directly, but must be called by an object of the class in which the method is defined.

(c) A method has direct access to the private data fields of its associated class.

(d) None of the above – methods and functions are identical.

5. **True** or **False** *(no explanation required)* – for a C++ class, ***operator overloading*** means operators such as **+** are used in multiple methods' code in the class definition.

6. In C++, a class declaration beginning '**`class X: public Y`**' implies: *(choose the correct answer)*

(a) class **`Y`** is a derived class of **`X`**

(b) class **`X`** is a derived class of **`Y`**

(c) **`X`** and **`Y`** are two different names for the same class, whose alias is **`Y`**

7. **Software engineering** aims to produce software which is: *(choose all that apply)*

(a) modifiable after it has been installed;

(b) minimum-cost;

(c) understandable by multiple "stakeholders" such as users and maintainers;

(d) aligned with the latest advances in software development.

8. Which of the following statements are true about a **Formal Transformation** software process model? *(choose all that apply)*

(a) The software procurer is typically consulted after each transformation stage, to get their feedback on what has been produced by that stage.

(b) Formal transformation software process models are widely used in the software engineering industry.

(c) A formal specification, which captures the pre and post conditions for all functions to be developed, is used as input to the transformation process.

(d) A formal specification must state what changes, if any, are made to each function's input parameters.

9. **True** or **False** *(no explanation required)* – a **top-down** testing strategy requires the development of test drivers, while a **bottom-up** testing strategy requires the development of test stubs.

10. Which of the following statements are true about a **sequence model** that is produced as part of an objected-oriented design approach? *(choose all that apply)*

(a) Interactions between the objects involved in a particular usage scenario are represented by labelled arrows.

(b) Usually, only the major usage scenarios are represented by sequence models.

(c) The arrows between objects involved in a particular usage scenario might not represent data transfers between those objects.

11. Which of the following are typical major phases in **compiling** a source program into machine code? *(choose all that apply)*

(a) character identification

(b) syntax analysis

(c) intermediate data generation

(d) code generation

12. **True** or **False** *(no explanation required)* – after a cache miss, loading the new data from main memory into the cache may take more than one CPU cycle.

13. Which of the following are typically found in the CPU of a computer? *(choose all that apply)*

(a) Register File

(b) Instruction Register

(c) Hard Disk

(d) Sound Card

14. **True** or **False** *(no explanation required)* – in C++ it is legal to use a **reference variable** as the return value from a function, even if the function does not modify any of its inputs.

15. **Complete this sentence:** in compiler implementations, a typical loop optimisation technique is to replace a loop which has a fixed number of iterations with _____ .

16. Which of the following are layers in the TCP/IP Reference Model? *(choose all that apply)*

(a) Session layer
(b) Host-to-network layer
(c) Application layer
(d) Datalink layer

17. The **multiplexing technique** in which a single link is shared between multiple transmissions by giving each transmitter a dedicated channel spectrum is called: *(choose the correct answer)*

(a) virtual circuits
(b) frequency division multiplexing
(c) channel multiplexing

18. **True** or **False** *(no explanation required)* – in a **connection-oriented** communication service, each message must include the intended receiver's address.

19. Which of the following are typical layers in a modern Operating System? *(choose all that apply)*

(a) Memory Manager
(b) Linker
(c) Kernel
(d) Command Processor

20. The three process states are **ready**, **running**, and which of the following: *(choose the correct answer)*

(a) paused
(b) sleeping
(c) blocked

21. **True** or **False** *(no explanation required)* – in C++, after a called function returns control to its calling function, the called function's variables are inaccessible.