15-17

A:

a)What are abstract classes and what is their use in software development?

Abstract classes may or may not contain abstract methods ie., methods with out body ( public void get(); )can define,and may partially implement,common behavior; Abstract class and inheritance collectively ensures that most of the code are written using abstract and higher level classes, so that it can leverage Inheritance and Polymorphism to support future changes.

B)What is the meaning of the specifier final which appears in the heading of the method fin()? A novice programmer asks you the question “does Java allow abstract final methods?”. Explain, with reasons, your reply.

Final method cannot be overridden by subclass. No, we can not declare abstract method as final. We have to proved implementation to abstract methods in subclasses.

C)Explain the purpose of the call to super() in the first line of the constructor Sub(). Is the order of the statements in the Sub() constructor important?

The parent class' constructor needs to be called before the subclass' constructor. This will ensure that if you call any methods on the parent class in your constructor, the parent class has already been set up correctly.It’s important to make sure call super() at first line in subclass constructor so that fields in superclass can be found,otherwise you can not pass compilation.

1. Explain with reasons the effect of the following statement Root root = new Root();

Explicitly Create a object,name “root”, belong to type Root and refer to new Root instance.

E） “Root Con. called”, “Sub Con. called”, “Root Con. called”, “Sub Con. called”

“Sub.f() called”,“Root.fin() called”,“Sub.g() called”,“different”

1. Explain why the code fragment in e) will compile despite the fact that neither the Root nor Sub classes contain an explicit equals method. What changes would you need to make to the class Sub so that instances were compared by value?

They all inherit Object class which has equal method,so they call “equal” directly. 在sub里加value属性，构造函数里加参数Rewrite the equal method with “override” ----方法体随意，比较value

A2:

1. Describe the meaning of the term package scope for a class and for a method.

A package is a namespace within which to organize related classes.

For class:1) public:accessible from anywhere, 2)protected: only class in the package where the member is declared 3)private:only inside the class 4)no modifier: either package-private

For method:1)public:from anywhere 2)private:only inside the class

1. What is an immutable class? Give two advantages of immutable classes

Its instances cannot be modified,no mutator method in it,forbid method override,all field private and final. Good:1)safe,simple,make good building blocking. 2 an immutable is only ever in exactly one state 3 thread safe

1. I:Explain the meaning of the final qualifier in the class declaration and in the declaration of the member fields of the Journal class.

Once a final variable has been assigned, it always contains the same value. A final class cannot be subclassed. Doing this can confer security and efficiency benefits, so many of the Java standard library classes are final

ii:Explain why instances of both Article and Journal are mutable.

In Article,it provide mutator to set text and author;In Journal’s constructor,after give reference to a new treeset,assign the value with contents,means assign for many times。应该是在 getdate里没用defensive copying 返回data.Gettime

iii Re-write the Journal class to make it immutable (without modifying the Article class).

先将content转成treeset再复制给edition就好

iiii: Briefly describe the changes necessary to make Article immutable. If these changes were made, would it still be necessary to re-write the Journal class as you did in iii) above? Briefly explain your answer.

删掉set方法加fianl; still necessary,because immutable means......but the original version of Journal do the assignment to edition many times

A3:

1. Describe and illustrate with a diagram the structure of a hash set and a tree set.

P43,+

HashSet is Implemented using a hash table. Elements are not ordered. The add, remove, and contains methods have constant time complexity O(1).

TreeSet is implemented using a tree structure(red-black tree in algorithm book). The elements in a set are sorted, but the add, remove, and contains methods has time complexity of O(log (n)). It offers several methods to deal with the ordered set like first(), last(), headSet(), tailSet(), etc.

1. It is possible to use hashing or trees to implement a Map interface. Preferably using the Big ‘O’ notation, compare and contrast the performance of the two data structures for the following operations: p54,55 hash table;binary tree 10marks

i) get or set a value at a given key in the map,

ii) insert or remove a key at an arbitrary position in the map.

Explain the conditions under which worst-case performance will arise for the hashing and tree implementations.

1. Map implemented by hashing: basically are O(1) for get or set operation,they may have bad performance for O(n) while hashCode() used is not proper and there are lots of hash collisions; Tree:O(logn),there is no worst-case for binary tree to do get or set op.
2. Map:讲道理跟上面一样。

c) A List may be implemented using either a resizable array or a linked list of elements. For each of the following scenarios, explain carefully which of these two implementations would be the most efficient to use and why. [6 marks] P53

i) A queue of people at a cinema ticket office.

ii) The names in a mobile phone address book.

1. Linked list :A queue must follow strict sequence. Everyone in the queue except the first and last one must have previous and next one. Using linked list can realize this structure which they store data with node and combine with point next and previous node. It’s easy to operate add and remove. While adding, just add to last one. And the same with remove just remove the first one.
2. Resizable array: This book must be easy to find data like get. And resizable array store data sequentially which make it fast to search data with always O(1). Because we do not always add data into such big book, so less trouble with its low efficient to add or remove data.

d) A Set would be a more suitable data structure than a List for the names in a mobile phone address book (the second scenario from part c) above). State the reason for this and also which of the Java Set implementations you would use if you were to implement this and why.

Using Set can make sure that there is no repeat data in the collection which in list they may insert the same data, leading redundancy .And I prefer to use Tree Set because it can automatically sort the data in set following a default rule. Here the tree set will sort with alphabetical order,making easy to check and find data.

B

B1

A) Outline the steps that a Java programmer should take in order to define and start a new thread of concurrent activity 5marks p24-26

1) Define a new class that extends Thread or implements Runnable.

2) Provide a suitable implementation of a run method.

3) Create an instance of the new class

4)invoke the start method on the thread object.

B) Write a program that creates three threads: one to print 10 times letter X, second to print 5 times letter Y, and the third one to print out integers from 2 to 8. After creating the three threads, the main program should terminate. [15 marks]

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C) In what ways is it possible for two threads to access the same object, and what steps should be taken to avoid interference? [5 marks] P32

If: 1.the object’s reference is passed as an argument to each thread 2.The object is a global(static) object 3..The object is defined in an enclosing scope(the threads are nested classes).

To prevent interference , one needs to ensure that all accesses to the share object are from within a critical section, implemented using the Java keyword synchronized

B2)

A) What are the three key features of a monitor and how are they used to support concurrent programming? 6marks p136-139 不是很确定

Features:



 Monitors combine data encapsulation, mutual exclusion, condition synchronization. The data structure encapsulated by the monitor is private, and can only be accessed via a set of public operations. Each operation acquire a lock associated with the monitor, thereby ensuring mutual exclusion and prevent interference. It is possible for operations to wait signal conditions associated with the state of the monitor.

b) University students are eligible for grants from the university hardship fund in case of financial difficulties. Occasionally, the fund receives donations from generous benefactors. Write a Java monitor to control the fund’s budget, remembering that the grants should only be given to students if there is enough money in the fund. [12 marks]

c) Provide an implementation of a Student class (or a Benefactor class) describing the behaviour of student threads (or benefactor threads), which access the fund from part b). [7 marks]

B3

1. What are the distinguishing characteristics of an event driven program as opposed to a conventional program? [4 marks]

P2

1. The flow of control in a sequential program is the order in which statements are execute.
2. In traditional sequential programming, the programmer determines the flow of control
3. In event driven programming, the flow of control is determined by external evens
4. The program responds to each event in predictable fashion, but has no control over the order in which events occur.

Event driven programming involves writing programs whose flow of control depends on a sequence of external events rather than the internal control logic of program itself

1. Describe briefly the basic steps that a Java programmer needs to take in order to set up event handlers and deal with events. [6 marks]
2. A class that implements the event listening interface
3. Code to handle the event
4. Code to register an instance of event handler class with the event source

Skeleton code:

Class Mylistener implements ActionListener{

..

Public void actionPerformed( ActionEvent e){

//code to handle the event}

}

Class Application{

//code to register an instance of the event, handling class with the event source

Component.addActionListener(new MyListener());}

1. define an event handling class that implements the “eventlistener”.

2.provide the necessary event handler code.

3.register an instance of the event handling class with an event source by calling the appropriate “addListener” method.

1. Design a simple event-driven program with a graphical user interface that allows the user to enter the width and the length of a rectangle into text boxes, and then calculates and displays the area of the rectangle. Describe how you would construct such a program, by identifying the basic Java Swing components you would use, and specifying how events are handled. Provide outline code for the relevant parts of the application. [15 marks]