

CS 5800 – Advanced Software Engineering

Quiz 2

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GitHub Link: <https://github.com/DevaanshMann/CS5800-Quiz2>

```
1 //CS5800 - Advanced Software Engineering
2 // Quiz 2 - October 16, 2025
3
4 import java.util.ArrayList;
5 import java.util.List;
6
7 class Book {
8     private String title;
9     private String author;
10    private List<String> chapters;
11
12    public Book(String title, String author, List<
String> chapters) {
13        this.title = title;
14        this.author = author;
15        this.chapters = chapters;
16    }
17
18    protected Book(Book other, boolean
deepCopyChapters) {
19        this.title = other.title;
20        this.author = other.author;
21        if (deepCopyChapters && other.chapters !=
null) {
22            this.chapters = new ArrayList<>(other.
chapters);
23        } else {
24            this.chapters = other.chapters;
25        }
26    }
27
28    public List<String> getChapters() {
29        return chapters;
30    }
31    public void setChapter(int idx, String value) {
32        this.chapters.set(idx, value);
33    }
34    public void addChapter(String value) {
35        this.chapters.add(value);
36    }
37
```

```
38     @Override
39     public String toString() {
40         return "Book{title='" + title + "', author
    ='" + author + "', chapters=" + chapters + "}";
41     }
42 }
43
44 class BookShallowCopy extends Book implements
    Cloneable {
45     public BookShallowCopy(String title, String
    author, List<String> chapters) {
46         super(title, author, chapters);
47     }
48
49     @Override
50     public BookShallowCopy clone() {
51         return new BookShallowCopy(this);
52     }
53
54     private BookShallowCopy(BookShallowCopy other
    ) {
55         super(other, false);
56     }
57 }
58
59 class BookDeepCopy extends Book implements
    Cloneable {
60     public BookDeepCopy(String title, String author
    , List<String> chapters) {
61         super(title, author, chapters);
62     }
63
64     @Override
65     public BookDeepCopy clone() {
66         return new BookDeepCopy(this);
67     }
68
69     private BookDeepCopy(BookDeepCopy other) {
70         super(other, true);
71     }
72 }
```

```
73
74 public class Main {
75     public static void main(String[] args) {
76
77         List<String> initialChapters = new
ArrayList<>();
78         initialChapters.add("Ch 1: Intro");
79         initialChapters.add("Ch 2: Patterns");
80         initialChapters.add("Ch 3: Prototype");
81
82         System.out.println("Part 2: Shallow Copy"
);
83         BookShallowCopy originalShallow = new
BookShallowCopy("Design Patterns", "EG, RH, RJ, JV
", new ArrayList<>(initialChapters));
84         BookShallowCopy cloneShallow =
originalShallow.clone();
85
86         originalShallow.setChapter(1, "Ch 2:
Structural Patterns");
87         originalShallow.addChapter("Ch 4: Extras"
);
88
89         System.out.println("Original (shallow): "
+ originalShallow);
90         System.out.println("Clone      (shallow): "
+ cloneShallow);
91
92         System.out.println("\nPart 3: Deep Copy");
93         BookDeepCopy originalDeep = new
BookDeepCopy("Design Patterns", "EG, RH, RJ, JV",
new ArrayList<>(initialChapters));
94         BookDeepCopy cloneDeep = originalDeep.
clone();
95
96         originalDeep.setChapter(0, "Ch 1: Overview
");
97         originalDeep.addChapter("Ch 4: Deep Dive"
);
98
99         System.out.println("Original (deep): " +
```

```
99 originalDeep);  
100         System.out.println("Clone      (deep): " +  
        cloneDeep);  
101     }  
102 }  
103
```

```
Run Main x
/Library/Java/JavaVirtualMachines/temurin-25.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA.app/Contents/lib/idea_rt.jar=54202 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -cla
Part 2: Shallow Copy
Original (shallow): Book{title='Design Patterns', author='EG, RH, RJ, JV', chapters=[Ch 1: Intro, Ch 2: Structural Patterns, Ch 3: Prototype, Ch 4: Extras]}
Clone (shallow): Book{title='Design Patterns', author='EG, RH, RJ, JV', chapters=[Ch 1: Intro, Ch 2: Structural Patterns, Ch 3: Prototype, Ch 4: Extras]}

Part 3: Deep Copy
Original (deep): Book{title='Design Patterns', author='EG, RH, RJ, JV', chapters=[Ch 1: Overview, Ch 2: Patterns, Ch 3: Prototype, Ch 4: Deep Dive]}
Clone (deep): Book{title='Design Patterns', author='EG, RH, RJ, JV', chapters=[Ch 1: Intro, Ch 2: Patterns, Ch 3: Prototype]}

Process finished with exit code 0
|
```