00582

Sri Lanka Institute of Information Technology

B. Sc. Special Honors Degree in Information Technology

Final Examination
Year 4, Semester I (2022)

IT4020 – Modern Topics in IT

Duration: 2 Hours

June, 2022

Instruction to Candidates:

- This paper is preceded by **10 minutes reading period**. The supervisor will indicate when answering may commence.
- There are 04 questions available, answer all 04 questions.
- There are 06 pages including cover page.
- Exam type – Online.
- Follow the instruction below to prepare the submission. Make sure to complete your submission within the exam time.
  - Create a folder using your student ID (**ITxxxxxx**) on the disk.
  - For each question, create a project/file inside your folder, as indicated in each question, using the question number as the name of the project/file (e.g.: - **Q1**).
  - Create a **ReadMe.txt** file inside the folder that includes your Student ID and your Name according to the registration.
  - At the end, zip your folder and upload the **ITxxxxxxx.zip** file, which includes all the projects and the files to the NetExam.
  - The supervisor will provide more instructions as required.

Question 1 (30 marks)

Create a Project in Eclipse IDE and name it as **Q1** and complete the following tasks in it.

This question is related to the **(Lambda Expressions in java) Functional Programming.** Refer the sample source code and given outputs of the program.

a) Transform following conventional Java program into Java Lambda Expressions format. This program uses two threads as **ProducerThread** and the **ConsumerThread**. The source code of **only** the **ProducerThread** is given and you should implement the **ConsumerThread** and **ProducerThread** both in **Lambda expressions**. Producer thread add elements for the list and consumer thread remove elements from the list. At the end of both threads' execution, it should ensure the list is empty. It should give the same output as mentioned in the console. **(20 marks)**

Hint: - You should implement both producer and consumer threads in one class using Lambda Expressions.

ProducerThread Implementation

```
public class ProducerThread implements Runnable {

	ArrayList<Integer> list;

	public ProducerThread(ArrayList<Integer> list) {
		this.list = list;
	}

	@Override
	public void run() {
		synchronized (list) {
			int value = 0;
			while (true) {
			   System.out.println("Producer started");
			   try {
			       value += 10;
			       list.add(value);
			       System.out.println("Producer adding value
			       = " + value + " to Queue");

			       list.wait();
			       Thread.sleep(1000);
			    } catch (InterruptedException e) {
			           e.printStackTrace();
			    }

			    list.notify();
			    System.out.println("Elements in Queue = " + list);
			}
		}
	}
}
```

Console Output with ThreadTest class

ConsumerThread.java | ProducerThread.java | ThreadTest.java

```
1  package conventional;
2  import java.util.ArrayList;
3
4  public class ThreadTest {
5
6      public static void main(String[] args) {
7          ArrayList<Integer> list = new ArrayList<>();
8          Thread producer = new Thread(new ProducerThread(list));
9          Thread consumer = new Thread(new ConsumerThread(list));
10         producer.start();
11         consumer.start();
12     }
13 }
14
```

Console | Problems | Javadoc

```
<terminated> ThreadTest (1) [Java Application]
Producer started
Producer adding value = 10 to List
Consumer started
Consumer thread consumes 10
Elements in List = []
Producer started
Producer adding value = 20 to List
Consumer started
Consumer thread consumes 20
Elements in List = []
Producer started
Producer adding value = 30 to List
Consumer started
Consumer thread consumes 30
Elements in List = []
Producer started
Producer adding value = 40 to List
Consumer started
Consumer thread consumes 40
Elements in List = []
Producer started
Producer adding value = 50 to List
Consumer started
Consumer thread consumes 50
```

b) Refer the conventional code given in the below program and refer the console output as well. Convert the program into **Method Reference** format. **(10 marks)**

ThirdType.java

```
1  package conventional;
2
3  import java.util.Arrays;
4
5  public class ThirdType {
6
7      public static void main(String[] args) {
8
9          String[] stringArray = { "sSS", "rrR", "aaa", "UUU", "Jjj", "PpP", "Yyy" };
10
11         Arrays.sort(stringArray, new Comparator<String>() {
12
13             @Override
14             public int compare(String value1, String value2) {
15                 return value1.compareToIgnoreCase(value2);
16             }
17         });
18
19         for (String value : stringArray) {
20             System.out.println(value);
21         }
22     }
23 }
24
```

Console

```
<terminated> Th
aaa
Jjj
PpP
rrR
sSS
UUU
Yyy
```

Question 2 (40 marks)

Create a Project in Eclipse IDE and name it as **Q2** and complete the following tasks in it.

Consider the Java Coding conventions and Best Practices and **Refactor the whole code** according to the given steps of the following. The code creates an XML file to store employee specific details and generated XML is given as the sample.

```
16    public static void main(String[] args) throws Exception {
17        Document xx = DocumentBuilderFactory.newInstance().newDocumentBuilder().newDocument();
18        Element rr = xx.createElement("School");
19        xx.appendChild(rr);
20        Element vv = xx.createElement("Students");
21        rr.appendChild(vv);
22        Element w3 = xx.createElement("Student");
23        vv.appendChild(w3);
24        Attr a1 = xx.createAttribute("gender");
25        a1.setValue("Male");
26        w3.setAttributeNode(a1);
27        Element v1 = xx.createElement("Name");
28        Attr e1 = xx.createAttribute("Initials");
29        e1.setValue("S.A.");
30        v1.setAttributeNode(e1);
31        v1.appendChild(xx.createTextNode("Nalaka Dissanayake"));
32        w3.appendChild(v1);
33        Element e33 = xx.createElement("Address");
34        Attr w1 = xx.createAttribute("No");
35        w1.setValue("115/1");
36        Attr w2 = xx.createAttribute("Street");
37        w2.setValue("Avenue Street");
38        e33.setAttributeNode(w1);
39        e33.setAttributeNode(w2);
40        e33.appendChild(xx.createTextNode("No:115/1, Avenue Street, Kandy"));
41        w3.appendChild(e33);
42        Transformer w6 = TransformerFactory.newInstance().newTransformer();
43        DOMSource w7 = new DOMSource(xx);
44        w6.transform(w7, new StreamResult(new File("students.xml")));
45        w6.transform(w7, new StreamResult(System.out));
46    }
47 }
```

Output

students.xml | XmlOutPutAnswer.java | GenerateXMLOutput.java

```
1  <?xml version="1.0" encoding="UTF-8" standalone="no"?>
2  <School>
3      <Students>
4          <Employee Gender="Male">
5              <Name Initials="S. A.">Nalaka Dissanayake</Name>
6              <Address No="115/1" Street="Avenue Street">No:115/1, Avenue Street, Kandy
7              </Address>
8          </Employee>
9      </Students>
10 </School>
```

a) Split the code into several high-cohesive reusable operations and invoke them to generate above node hierarchy when you build the XML file. **(32 marks)**

NOTE: Use proper constants to store hard-coded strings and values. Use proper internal parameters and return types for these operations and marks are allocated for operations considering the Exception Handling, comments and usage of Constants.

```
1. createDocument()          - 02 marks
2.createElement()            - 02 marks
3.createAttribute()          - 03 marks
4.appendChild()              - 03 marks
5.setAttributeForElement()   - 02 marks
6.transformToXml()           - 04 marks
7.buildXmlFile()             - 16 marks
                 Total marks = 32 marks
```

b) Handle Exceptions correctly. (03 marks)

c) Use proper method level, Single line, Multi-line and the class level comments. (05 marks)

Question 3 (10 marks)

Create a MS Word document named **Q3.docx** inside your folder and write the answer for this question in it. In the Word document, make sure to include your Student ID and the Name.

This question is based on the **Augmented Reality and Reality Mixing**.

a) Explain how Augmented Reality can be applied in the education domain. Elaborate your idea using some examples. **(05 marks)**

b) Explain the concept of Virtual Reality and apply it with real-world examples to elaborate your idea. **(05 marks)**

Question 4 (20 marks)

Create a MS Word document named **Q4.docx** inside your folder and write the answer for this question in it. In the Word document, make sure to include your Student ID and the Name.

You are working for a solution-based organization and your client requires you to design and develop a system for a university. The business goal is to develop web services and expose them to some external web content providers to invoke student data in a more personalized manner.

In the initial step, client wants to narrow down the development to two services.

a) Student Profile
b) Class Timetable

Also, the client would like to host the services in Azure.

a) Your first task is to identify couple of Azure resources you will be using to develop the solution. Identify three Azure resources and briefly explain the purpose of each, stating their pros and cons. **(9 marks)**

b) Client requires to have one base URL for both student service and class timetable service. What is your approach to cater that requirement? What is the specific Azure Service you will be using for that? Justify your selection. **(5 marks)**

c) During the first demonstration client requested you to implement authentication. What technologies you would choose? Justify your selection. **(6 marks)**