00386

Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Software Engineering

Final Examination

Year 3, Semester 1 (2022)

SE3010 - Software Engineering Process and Quality Management

Duration: 2 Hours

June 2022

Instructions to Candidates:

- This paper contains four questions.
- Use the provided template to answer question 1. Answer the rest of the questions in the booklet given.
- Total marks for the paper is 100 (Contributes to 60% of the final grade).
- This paper contains six pages, including the cover page.
- The use of calculators is allowed.

Question 01 (32 marks)

Consider the following code snippet and answer the questions given below. Use the provided template to answer the questions.

Line No	Program Statements
1	`import javax.swing.JOptionPane;`
2	`public class Palindrome{`
3	`public static void main(String[] args){`
4	`long num, temp;`
5	`String inputStr, outputStr;`
6	`inputStr = JOptionPane.showInputDialog("Enter an integer," + "positive or negative");`
7	`num = Long.parseLong(inputStr);`
8	`temp = num;`
9	`if (num <= 0){`
10	`num = -num;`
11	`inputStr = inputStr.valueOf(num);`
	`}`
12	`if (isPalindrome(inputStr))`
13	`outputStr = temp + " is a palindrome";`
14	`else`
15	`outputStr = temp + " is not a palindrome";`
16	`JOptionPane.showMessageDialog(null,outputStr,"Palindrome Prg",JOptionPane.INFORMATION_MESSAGE);`
17	`System.exit(0);`
	`}`
18	`public static boolean isPalindrome(String str){`
19	`int len = str.length();`
20	`int i, j;`
21	`j = len - 1;`
22	`for(i = 0; i <= (len - 1)/2; i++){`
23	`if(str.charAt(i) != str.charAt(j))`
24	`return false;`
25	`j--;`
	`}`
26	`return true;`
	`}`
	`}`

a) List the tokens that would be identified under the **Weighted Composite Complexity (WCC)** measure. **(18 marks)**

b) Calculate the values of the **S, W_n, W_i, W_c, W_t, WC,** and **WCC** attributes. **(14 marks)**

00386

Question 1 (a)

Line No	Tokens														
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															

00386

13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															

00386

Question 1(b)

Line No	Program Statements	S	W_n	W_i	W_c	W_t	WC
1	import javax.swing.JOptionPane;						
2	public class Palindrome{						
3	public static void main(String[] args){						
4	long num, temp;						
5	String inputStr, outputStr;						
6	inputStr = JOptionPane.showInputDialog("Enter an integer," + "positive or negative");						
7	num = Long.parseLong(inputStr);						
8	temp = num;						
9	if (num <= 0){						
10	num = -num;						
11	inputStr = inputStr.valueOf(num);						
	}						
12	if (isPalindrome(inputStr))						
13	outputStr = temp + " is a palindrome";						
14	else						
15	outputStr = temp + " is not a palindrome";						
16	JOptionPane.showMessageDialog(null,outputStr,"Palindrome Program",JOptionPane.INFORMATION_MESSAGE);						
17	System.exit(0);						
	}						
18	public static boolean isPalindrome(String str){						
19	int len = str.length();						
20	int i, j;						
21	j = len - 1;						
22	for(i = 0; i <= (len - 1)/2; i++){						
23	if(str.charAt(i) != str.charAt(j))						
24	return false;						
25	j--;						
	}						
26	return true;						
	}						
	}						
WCC Value							

Question 02 **(20 marks)**

Consider the following code snippet and answer the questions given below.

```
1  public void computeCollisions( ) throws IOException, FileNotFoundException {
2   int hashIndex = 0;
3   System.out.println ("Size\t\t\tCollisions");
4   for(int size = NW; size <= 10 * NW; size += NW){
5    table = new String[size];
6    FileInputStream Ireader = new FileInputStream(new File("distinct.txt"));
7    InputStreamReader Breader = new InputStreamReader(Ireader);
8    BufferedReader diskInput = new BufferedReader(Breader);
9    int collisions = 0;
10   String line = diskInput.readLine();
11   while (line != null && line.length() > 0) {
12    hashIndex = Math.abs(line.hashCode()) % size;
13    if (table[hashIndex] == null)
14     table[hashIndex] = line;
15    else
16     collisions++;
17   line = diskInput.readLine();
18    }
19   System.out.println (size + "\t\t\t" + collisions);
20  }
21 }
```

a) Draw the control flow graph and list the number of edges and nodes in it. Label the start node, stop node, decision nodes, and true-false paths. **(10 marks)**

b) Calculate the Cyclomatic complexity as a function of the number of nodes and edges. **(3 marks)**

c) Calculate the Cyclomatic complexity as a function of the decision nodes. **(3 marks)**

d) Calculate the Cyclomatic complexity of the disassembled byte code of the `public void computeCollisions()` method. **(4 marks)**

Question 03 **(24 marks)**

a) Explain the importance of test automation in modern software development environments. **(4 marks)**

b) Using a real-world example, explain why it is required to apply both equivalence partitioning and boundary value analysis techniques to identify the optimum set of test cases . **(4 marks)**

c) Apply a suitable specification-based test case design technique and identify all optimum set of test cases for testing the business requirements given below.

i) An online learning application for little children provides a quiz at the end of each lesson. When a child attempts a quiz based on the marks obtained (out of 20), message will be shown as follows:

- If the child has obtained more than 17 marks, then the message shown by the application would be *"Excellent Job! You get 3 stars"*.
- If the child has obtained a mark less than or equal to 17 and more than 12, then the message shown by the application would be *"Good Job! You get 2 stars"*.
- If the child has obtained a mark less than or equal to 12 and more than 7, then the message shown by the application would be *"Nice Try! You get a star"*.
- If the child has obtained a mark less than or equal to 7, then the message shown by the application would be *"Try Again..."*. **(8 marks)**

ii) A bank allows its customers to open a fixed deposit account for a maximum of one year. The bank automation system generates the interest rates for a fixed deposit as follows:

- If the duration is less than or equal to 6 months, then the interest rate is 7%.
- If the duration is more than 6 months, then the interest rate is 12%.
- If the account holder's age is greater than 60, then an additional 3% is added to the interest rate. **(8 marks)**

Question 04 **(24 marks)**

Consider the following code snippet and answer the questions given below.

```
1  public static void main(String []args)
2  {
3     Scanner sc=new Scanner(System.in);
4     System.out.println("Enter the age: ");
5     int age=sc.nextInt();
6     System.out.println("Enter the weight: ");
7     int weight=sc.nextInt();
8     if(age>=18 && age<70)
9     {
10       if(weight>50)
11       {
12          System.out.println("Eligible to donate blood");
13       }
14       else
15       {
16          System.out.println("Not eligible to donate blood");
17       }
18    }
19    else if (age < 18)
20    {
21       System.out.println("Age must be greater than 17");
22    }
23    else
24    {
25       System.out.println("Age must be less than 70");
26    }
27 }
```

The following set of test data are used for testing the above code snippet:

Test data set number	Age	Weight
1	12	22
2	18	65
3	29	47
4	35	50

a) Calculate the percentage of decision coverage achieved by the given test data sets. **(2 marks)**

b) Calculate the percentage of path coverage achieved by the given test data sets. **(4 marks)**

c) Suggest a suitable update to get 100% code coverage. **(3 marks)**

d) Assume that it has been requested to modify the above code to accommodate the following change request:

> In addition to age and weight, the application has to check the gender of the applicant and provide the eligibility to donate blood. Updated conditions are as follows;
>
> - A male has to be between 18 to 70 years old, and his weight has to be greater than 55kgs to be eligible for blood donation.
> - A female has to be between 20 to 65 years old, and her weight has to be greater than 50kgs to be eligible for blood donation.

i) Write the modified code to accommodate to this change request. **(8 marks)**

ii) Identify the test data set(s) to achieve 100% code coverage for the modified application. **(7 marks)**

END OF EXAMINATION PAPER