



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 (j = 0; j <= (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)

[illegible]

Question 1(b)

Line No	Program Statements	S	W _n	W _i	W _c	W _f	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	}						
13	if (isPalindrome(inputStr))						
14	outputStr = temp + " is a palindrome";						
15	else						
16	outputStr = temp + " is not a palindrome";						
17	JOptionPane.showMessageDialog(null, outputStr, "Palindrome Program", JOptionPane.INFORMATION_MESSAGE);						
18	System.exit(0);						
19	}						
20	public static boolean isPalindrome(String str){						
21	int len = str.length();						
22	int i, j;						
23	j = len - 1;						
24	for(i = 0; i <= (len - 1)/2; i++){						
25	if(str.charAt(i) != str.charAt(j))						
26	return false;						
27	return true;						
28	}						
29	}						

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	}

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