ECE318: Programming Principles for Engineers

Midterm Quiz

Thursday, 19 October 2023

Duration: 1 hour
Type: Multiple choice
Number of questions: 25

Instructions:

1) Please **circle** the correct answer.
    a. Possible answers are included right underneath each question.
    b. If the circle is not visible or clear around your selection, you answer will not be considered as an answer – i.e., the answer will be zeroed.
    c. If you use other symbols to indicate your answer (e.g., tick, X etc.), your answer will not be accepted – i.e., the answer will be zeroed.
2) You need to answer ALL questions.
3) There is only **ONE correct answer** in all questions.
4) Please hand in the completed sheet.
5) You are not allowed to use a calculator or the Internet by any means.
    a. No smartphones/smartwatches/smart devices are allowed.
    b. No Internet is allowed.

QUESTIONS

Q1: What value will be printed by this line of Java code;

(2 marks)

```
System.out.println(2.0 * (5 / 2));
```

A. 4
B. 4.0
C. 5
D. 5.0
E. This line of code will give an error.

Q2: What value will be printed by the following line of Java code?

(2 marks)

```
System.out.println( " " + 2.0 * (5 / 2));
```

A. 4
B. 4.0
C. 5
D. 5.0
E. This line of code will give an error.

Q3: What is the return type in the following method signature?

(2 marks)

```
public float squareRoot(int x)
```

A. public
B. float
C. squareRoot
D. int

Q4: How will the last printed line look based on the following block of Java code?

(4 marks)

```
int x= 3;
for (int i = 1; i <= x; i++)
{
   String str="v";
   for (int j = 0; j < i; j++)
   {
      str= str + "CPU";
   }
   System.out.println(str);
}
```

A. CPUCPU
B. vCPUCPU

C. CPUvCPUvCPU
D. vCPUCPUCPU

Q5: How will the third printed line look as produced by the following class?

(6 marks)

```
public class Main {
    public static void main(String args[]) {
        int arr[][] = new int[4][];
        arr[0] = new int[1];
        arr[1] = new int[2];
        arr[2] = new int[3];
        arr[3] = new int[4];

        int i, j, k = 0;
        for (i = 0; i < 4; i++) {
            for (j = 0; j < i + 1; j++) {
                arr[i][j] = k;
                k++;
            }
        }
        for (i = 0; i < 4; i++) {
            for (j = 0; j < i + 1; j++) {
                System.out.print(" " + arr[i][j]);
                k++;
            }
            System.out.println();
        }
    }
}
```

A. 10 11 12 13
B. 0, 1, 2, 3
C. 3 4 5
D. 6 7 8 9

Q6: Consider the following method enabling a swap of two elements for an array:

(4 marks)

```
void swap(int[] arr, int i, int j)
{
      int temp = arr[i];
      arr[i] = arr[j];
      arr[j] = temp;
}
```

Array arr = {7, 3, 9, 5} is passed and swap(arr, 1, 2) is called. Which is the new state of arr?

A. {7, 9, 3, 5}

B. {7, 3, 5, 9}

C. {7, 3, 9, 5}

D. {3, 7, 9, 5}

Q7: Consider the below code snippet:

(4 marks)

```
ArrayList<String> list = new ArrayList<>();
list.add("A");
list.add("B");
list.add(1, "C");
list.remove("A");
```

Which of the following represents the correct state of the list?

A. ["C", "B"]

B. ["B", "C"]

C. ["A", "C"]

D. ["C", "A"]

Q8: Consider the LinkedList operation:

(4 marks)

```
LinkedList<String> cities = new LinkedList<>();
cities.add("Paris");
cities.add("NewYork");
cities.addFirst("London");
String city = cities.get(1);
```

What will be the value of the city variable?

A. "Paris"

B. "London"

C. "NewYork"

D. An error will occur

Q9: Review the following swap method for arrays:

(4 marks)

```
void swap(int[] arr, int I, int j)
{
     int temp = arr[i];
     arr[i] = arr[j];
     arr[j] = arr[i];
}
```

What's wrong with this function?

A. Nothing, it swaps the values correctly.

B. The swap will not occur; both `arr[i]` and `arr[j]` will have `arr[j]`'s value.

C. It will throw an out-of-bounds exception.

D. The temp variable is redundant.

Q10: Consider the following class that processes sentences:

(10 marks)

```
import java.util.HashMap;

public class SentenceProcess{

    public static void main(String[] args) {

        String str = " I love Heavy Metal Black Metal Thrash Metal";
        String[] split = str.split(" ");

        HashMap<String,Integer> map = new HashMap<String,Integer>();
            for (int i=0; i<split.length; i++) {
            if (map.containsKey(split[i])) {
                int count = map.get(split[i]);
                map.put(split[i], count+1);
            }
            else {
                map.put(split[i], 1);
            }
        }
        System.out.println(map);
    }
}
```

Also consider that (i) split() splits a String based on a delimiter and in our case is empty space and HashMap.put() method of HashMap is used to insert a mapping into a map and HashMap.containsKey() method is used to check whether a particular key is being mapped into the HashMap or not.

What will be the print output of the map?

A. {love=1, Heavy=1, I=1, Metal=3, Black=1, Thrash=1}
B. {love=1, Heavy=1, I=1, Metal=2, Black=1, Thrash=1}
C. An error will be raised for not containing key in map due to empty spaces in str
D. {love=1, Heavy=1}
E. {love=1, Heavy=1, Metal=1, Black = 1, Thrash = 1}

Q11: Consider the following piece of code producing a specific arithmetic sequence as an output:

(10 marks)

```
public class Sequence{
    public static void main(String[] args) {
        int num, a = 0,b=0, c =1;
        Scanner in = new Scanner(System.in);
        System.out.println("Enter a number");
        num = in.nextInt();
        System.out.println("Sequence of the number is:");
        for (int i=0; i<num; i++) {
            a = b;
```

```
            b = c;
            c = a+b;
            System.out.print(a + ",");
        }
    }
}
```

Assuming I enter the number 10 as input, what will be the sequence output of this code?

A. Sequence of the number is:0,1,2,3,5,8,13,21,34
B. Sequence of the number is:0,1,1,2,3,5,8,13,21,34,
C. Sequence of the number is : 0,1,1,2,2,3,3,5,5,6,6,
D. Sequence of the number is:1,1,2,3,5,8,13,21,34,

Q12: What's the worst case time complexity of the following code?

(6 marks)

```
int i, j, k = 0;
for (i = n / 2; i <= n; i++) {
    for (j = 2; j <= n; j = j * 2) {
        k = k + n / 2;
    }
}
```

A. O(n)
B. O(nlogn)
C. $O(n^2)$
D. $O(n^{2\log n})$

Q13: Algorithm X and Y have a worst-case running time of O(n) and O(logn), respectively. Therefore, algorithm Y always runs faster than algorithm X.

(4 marks)

A. True
B. False

Q14: In Java we manage memory in our code via:

(4 marks)

A. malloc()
B. free()
C. dereferencing an object using &obj
D. none of the above

Q15: In Java, String is a primitive data type:

(2 marks)

A. True
B. False

Q16: Which component in Java is responsible for converting byte code into machine specific code?

(2 marks)

A. JDK
B. JRE
C. JVM
D. IDE

Q17: Java is:

(2 marks)

A. Platform independent programming language
B. Code independent programming language
C. Symbol independent programming language
D. Network independent programming language

Q18: The following code is a prime example of pass by reference:

(2 marks)

```
int a = 10;
```

A. True
B. False

Q19: What is the time complexity of the following code?

(5 marks)

```
int i, n = 8;
for (i = 1; i <= n; i++)
{
    System.out.println("Hello World !!!");
}
```

A. O(n)
B. $O(n^2)$
C. $O(2^n)$
D. O(nlogn)

Q20: The Young Generation in the Java Garbage Collector (JGC) is where:

(4 marks)

A. All new objects are allocated and aged
B. All new objects are kept for application running for a long period
C. All new objects are placed such as to perform a major garbage collection
D. All new objects and metadata are kept for each running thread

Q21: Java is a procedural programming language.

(2 marks)

A. True
B. False

Q22: Procedural languages such as Java can provide inheritance through the superclass/subclass paradigm.

(2 marks)

A. True
B. False

Q23: Programs written in Java are compiled into standard machine language.

(3 marks)

A. True
B. False

Q24: In a Stop-the-World-Event during the Java Garbage Collection process:

(4 marks)

A. All threads from your program are stopped and a quick sweep takes place.
B. All threads from your program are executed and a quick sweep takes place.
C. All threads from your program are parallelised and a quick sweep takes place.
D. All threads from your program are interrupted for a major sweep across all memory heap sections.

Q25: Consider the following code:

(6 marks)

```
class Grandparent {
    public void Display() {
        System.out.println("Grandparent's Display()");
    }
}

class Parent extends Grandparent {
    public void Display() {
        System.out.print("Parent's Display()");
    }
}

class Child extends Parent {
    public void Display() {
        super.super.Display();
```

```
        System.out.print("Child's Display()");
    }
}

public class Main {
    public static void main(String[] args) {
        Child c = new Child();
        c.Display();
    }
}
```

What will the output be?

A. Compiler error
B. “Grandparent’s Display()”
C. “Grandparent’s Display()”, ”Parent’s Display()”, “Child’s Display()”
D. “Child’s Display()”

END OF THE QUIZ