UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

205

Academic Year 2017/2018 – Second Year Examination – Semester I – 2019

SCS 2204 – Functional Programming

TWO (2) HOURS

To be completed by the candidate

Examination Index No: .....

Important Instructions to candidates:

1. The medium of instruction and question is **English**.
2. If a page or a part of this question paper is not printed, please inform the supervisor immediately.
3. Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
4. Write your index number on each and every page of the Question paper.
5. This paper has **04** questions and 14 pages.
6. Answer **ALL** questions. All questions carry equal marks (25 marks).
7. **01st question is** of the MCQ (Multiple Choice Questions) type. Each question will have 5 (five) choices with **one or more** correct answers. **There will be a penalty for incorrect responses to discourage guessing.** Questions 02 – 04 are of structured type. Answers should be marked and written in this question paper.
8. Any electronic device capable of storing and retrieving text including electronic dictionaries and mobile phones are **not allowed**.
9. Calculators are **not allowed**.

For Examiner's use only	
Question No	**Marks**
1	
2	
3	
4	
Total	

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Question 1

This question is of the MCQ (Multiple Choice Questions) type having 20 questions. Each question will have 5 (five) choices with one or more correct answers. **There will be a penalty for incorrect responses to discourage guessing.** Circle (the) correct answer(s) in this question paper.

1) Scala is an acronym which stands for:

(a) Scalable language	(b) Static language	(c) Scala Language
(d) Secure Language	(e) Scale language	

2) Select from the following which stands for REPL?.

(a) Read-Evaluate-Print-Loop	(b) R-EXE-Print-Loop	(c) R-Even-Print-Loop
(d) Real-Extend-Print-Loop	(e) Read-Eval-Pie-Loop	

3) Select from the following the correct keyword to store data which **cannot** be changed in Scala.

(a) value	(b) variable	(c) var
(d) val	(e) final	

4) Select from the following legal identifiers in Scala.

(a) name	(b) _2	(c) var1
(d) my_value	(e) "our.values"	

5) Select from the following valid expressions in Scala.

(a) var ch:Char = 20	(b) val data:Long=234L	(c) var no:Int = 0xff
(d) val number:Int = 40	(e) var no:Float = 34.0f	

6) The root of all the types in Scala is:

(a) AnyVal	(b) AnyRef	(c) Any
(d) null	(e) nothing	

7) Consider the following expression in Scala.

```
val(myValue1,myValue2)=Pair(1234,"abc")
```

Select from among the following, values assigned to each variable.

(a) 1234 → myValue1	(b) 1234 → myValue2	(c) Pair → "abc"
(d) "abc" → myValue2	(e) "abc" → myValue1	

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8) Consider the following expressions evaluation and the errors generated.

```
scala> var a:Long=20
a: Long = 20

scala> var b:Int=a
<console>:12: error: type mismatch;
 found   : Long
 required: Int
       var b:Int=a
                 ^
```

Select from the following the required correction(s) to avoid the error occured in the expression evaluation.

(a) val a:Long=20	(b) var a:Long={int}20	(c) var b:Int=(Int)a
(d) var b:Int=a.toInt	(e) val b:Int=a	

9) Select from the following, correct notations to print multiline strings in Scala.

(a) " string "	(b) "\nString"	(c) "\\String"
(d) """string """	(e) "\\\ String \\\"	

10) Select from among the following valid escapes sequences in Scala.

(a) \\	(b) /n	(c) \n
(d) //	(e) \"	

11) Consider the following program noting the word **blank.**

```
object Hello{
   def printMe( ) : blank = {
      println("Hello, Scala!")
 }
}
```

Which of the following should be used to replace the word **blank** to indicate that the function does not return a value.

(a) blank	(b) null	(c) nothing
(d) Unit	(e) NoValue	

12) What is the meaning of the acronym SBT?

(a) Scala Build Tools	(b) Scala Basic Tool	(c) System Break Tube
(d) Scala Basic Text	(e) System Build Tool	

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13) Consider the following segment of code written in Scala.

```
for (i <- 0.to(3)) {
    print(i)
}
```

What would be the output of the program?

(a) 0123	(b) 012	(c) 321
(d) 32	(e) error	

14) Consider the following segment of code written in Scala.

```
for (i <- 0.until(3)) {
    print(i)
}
```

What would be the output of the program?

(a) 0123	(b) 012	(c) 321
(d) 32	(e) error	

15) Consider the following segment of code written in Scala.

```
for (i <- Range(0, 5, 2)) {
    print(i)
}
```

What would be the output of the program?

(a) 023	(b) 0234	(c) 024
(d) 02	(e) error	

16) Consider the following segment of code written in Scala

```
for (i <- Range(10, .5, -1)) {
    print(i)
}
```

What would be the output of the program?

(a) 1098	(b) 10987	(c) 109876
(d) 1098765	(e) error	

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17) Consider the following segment of code written in Scala.

```
def getWhatAsWhat(x: Any):String = x match {
  case s: String => s + " is a String"
  case i: Int => "Int"
  case f: Float => "Float"
  case l: List[_] => "List"
  case _ => "Unknown"
}
```

When this segment of program is called, by typing the following command

```
def Unknown
```

What would be the output of the program?

(a) Unknown	(b) List	(c) Float
(d) Int	(e) error	

18) Consider the following segment of program written in Scala.

```
def printWhat() {
    var i = 1
    while (i <= 4) {
      var j = 1
            while (j <= 4) {
        val prod = (i * j).toString
        var k = prod.length
        while (k < 4) {
          print(" ")
          k += 1
        }
        print(prod)
        j += 1
      }
      println()
      i += 1
    }
  }
```

Select from the following the way(s) one can call this program.

(a) error	(b) toString()	(c) print(prod)
(d) printWhat()	(e) prod.length	

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19) Consider the following segment of program written in Scala.

```
"hello world".split(" ").foreach(println)
```

What would be the output of the program?

(a) "hello world"	(b) error	(c) foreach()
(d) world hello	(e) hello world	

20) Consider the following segment of program written in Scala.

```
"hello world".distinct
```

What would be the output of the program?

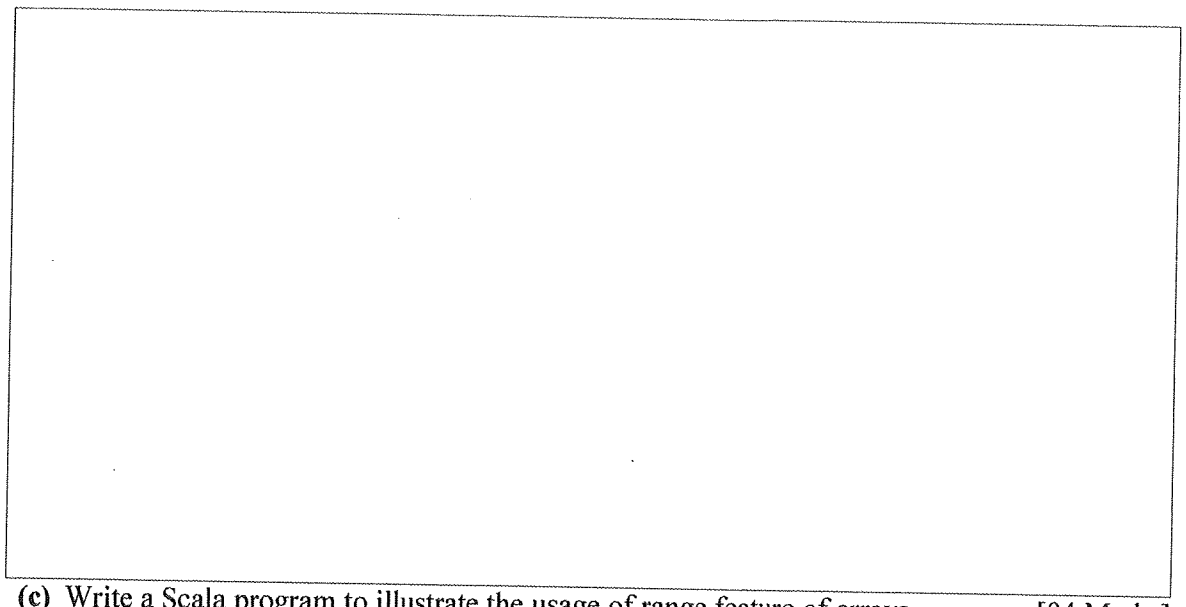
(a) ll l	(b) helo wrd	(c) hello world
(d) llllll llllll	(e) error	

Question 2

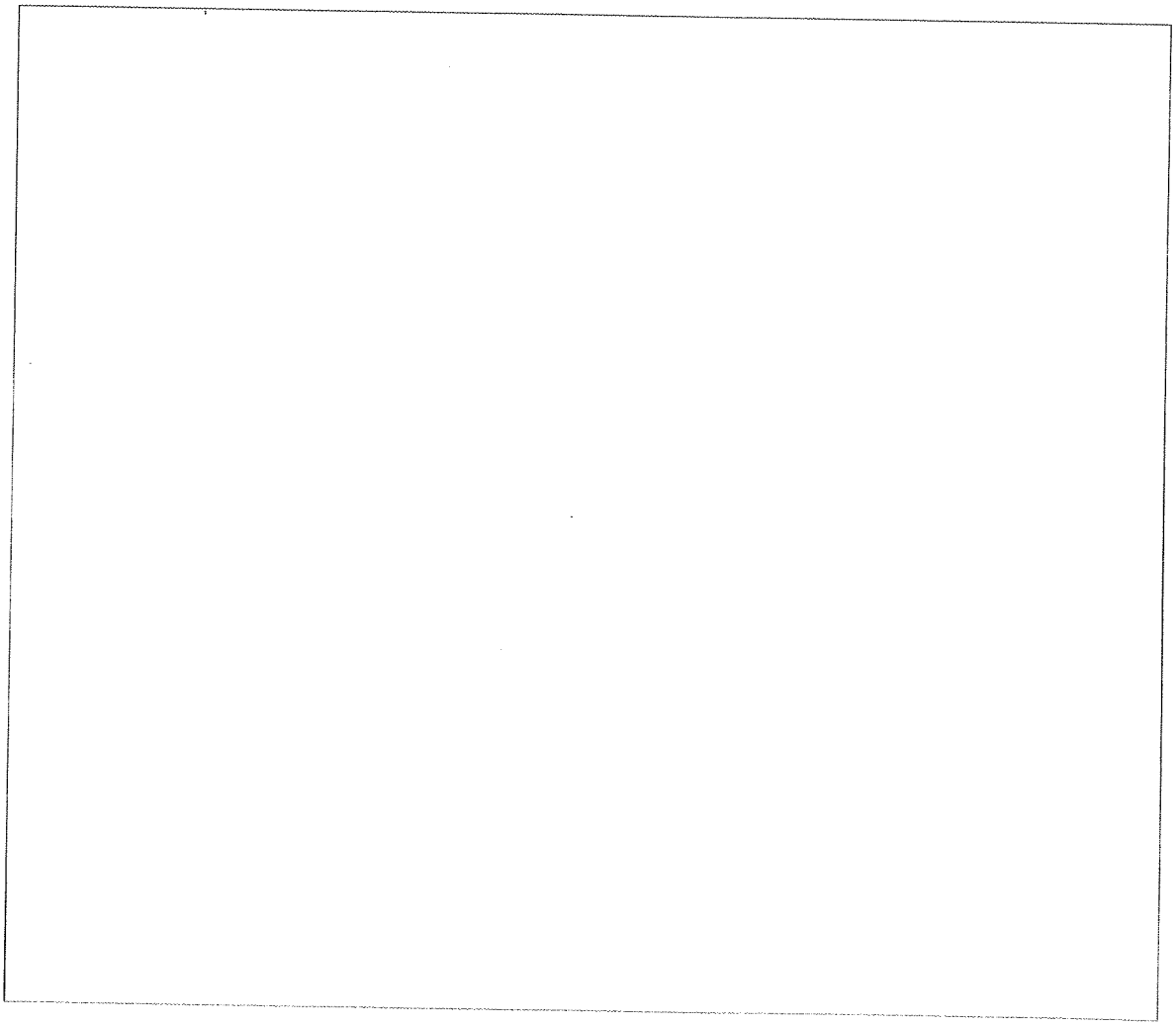
(a) Write examples of tuples and explain the main features of tuples in Scala. [04 Marks]

(b) Write a Scala program to illustrate how to iterate over all the elements in an array.

[05 Marks]



(c) Write a Scala program to illustrate the usage of range feature of arrays. [04 Marks]



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(d) Explain the following functions related to Array class in Scala using examples.

[04 X 03 Marks]

:+

++

+:

++:

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Question 3

(a) List four (4) benefits of Functional Programming. [04 Marks]

(b) Briefly discuss the difference between **Concurrent** program and **Parallel** program.

[05 Marks]

(c) By using an example explain Higher Order functions. [04 Marks]

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(d)

i. The function isEven transforms the input Integer value into a Boolean value based on the expression i % 2 == 0. Implement the Scala version of isEven as an anonymous function.

[03 Marks]

ii. Implement an anonymous function evenNumbers to filter the even numbers from a given list by using the isEven function define in the section (i). [04 Marks]

iii. Implement an anonymous function sum to calculate the addition of the even numbers in a given list by using the evenNumbers function define in the section(ii).

[05 Marks]

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Question 4

(a) The following Scala code will read the lines of the given file called sample.txt into an iterator called source.

```
val source = Scala.io.Source.fromFile("sample.txt").getLines
```

i. Define a function called **words** to return a list of words by giving the iterator **source**. [05 Marks]

ii. Define a function called **wc** to calculate the number of words in the given file by using the function **words** define in the section (i). [05 Marks]

(b) Discuss the concept of the **Actor** with regard to Scala concurrent program. [05 Marks]

(c) Implement the **receive** method of the following actor system which add or multiply the given integer values based on the given command "add" or "multiply".

```
case class Message(op:String,x:Int,y:Int)

class HelloAkka extends Actor {
  def receive = {
   ///TODO
  }
}

object Main extends App {
  val system = ActorSystem("HelloSystem")
  val cal = system.actorOf(Props[HelloAkka],
              name = "HelloAkka")
   cal!Message("add",5,6)
   cal!Message("multiply",5,6)
}
```

[05 Marks]

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(d) Suppose we implement an actor system to calculate the average of the temperature when it receives temperature values from multiple temperature sensors. Implement the actor called **average** which calculates the average of the temperature.

[05 Marks]

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