BACHELOR OF COMPUTER SCIENCE AND ENGINEERING

Third Year | First Semester | Class Test I

Principles of Programming Language (Set I)

Time- Fifty Minutes **Full Marks-30**

1.

a. What is referential transparency? Is rand() referentially transparent?

b. How do you define anonymous functions in Java? How is it different from methods in Java?

4+6=10

2.

a. Write code snippet in Java using Predicate or its variations to generate even numbers between [40,100]. Could it be done with Stream.iterate(…) method?

b. Generate a stream of 10 random numbers. Is the generation process stateless and/or bounded?

5+5=10

3.

a. Given a text file, count the number of times each word appears.

b. Using map(…) and reduce(…) how could you find number of objects from a list? Would the result vary in case of parallel stream? Justify your answer.

6+4=10

BACHELOR OF COMPUTER SCIENCE AND ENGINEERING

Third Year | First Semester | Class Test I

Principles of Programming Language(Set II)

Time- Fifty Minutes | **Full Marks-30**

1.
a. Describe the resolution rules for default methods. Based on the rules, can you override equals or hashCode in a default method?
b. Predict the output of `BinaryOperator add=(x,y)→x+y` Justify your answer. 4+3+3=10

2.
a. Print the result of summing up first 20 fibonacci numbers using Streams.
b. From an array of words (i) count and print the number of different letters using Streams; (ii) Print the sum of the length of all the words. 4+3+3=10

3.
a. Which methods can be pipelined? What is the advantage of it?
b. Write an implementation of the functions max() and count() using only reduce and lambda expressions. 6+4=10

BACHELOR OF COMPUTER SCIENCE AND ENGINEERING

Third Year | First Semester | Class Test I

Principles of Programming Language(Set III)

Time- Fifty Minutes **Full Marks-30**

1.

a. Differentiate between Streams and Collections.

b. How can functions be treated as first class data values? Give an example. 6+4=10

2.

a. Print the result of summing up first 20 even numbers using Streams.

b. From an array of words (i) count and print the number of different words using Streams; (ii) Print the sum of the length of all the words of length greater than 3. 3+3+4=10

3.

a. Convert the following code snippet to internal iteration:

```
List<Integer> numbers = Arrays.asList(1, 2, 3, 4, 5);
    int sum = 0;
    for (int n : numbers) {
      if (n % 2 == 1) {
        int square = n * n;
        sum = sum + square;
      }
    }
    System.out.println(sum);
```

b. Find the String with the largest number of lowercase letters from a List<String>. You can return an Optional<String> to account for the empty list case. 5+5=10

BACHELOR OF COMPUTER SCIENCE AND ENGINEERING

Third Year | First Semester | Class Test II

Principles of Programming Language (Set I)

Time- Fifty Minutes **Full Marks-30**

1.

a. State two theorems of Church-Rosser.

b. Reduce (lx. l z.z) ((ly. yy) (lu. uu)) following call by name and call by value. State the kind of reduction method used in each step. 4+6=10

2.

a. Write a program in Prolog that prints sum of first 10 natural numbers.

b. Write Prolog clauses to express the relationships: grandparent, sibling. Given parent(X,Y) means X is a parent of Y. 5+5=10

3. Write a program in Prolog to compute gcd according to Euclid's algorithm. Compare it with the following method:

```
gcd(U,V,W):-not(V=0), R is U mod V, !
gcd(V,R,W)
```

10

BACHELOR OF COMPUTER SCIENCE AND ENGINEERING

Third Year | First Semester | Class Test I

Principles of Programming Language (Set II)

Time- Fifty Minutes | **Full Marks-30**

1.

a. Formally define lambda calculus.

b. How to compute natural numbers in Lambda calculus if the successor function is successor $n =_{def} \lambda wyx.y(wyx)$? Show the steps to find out successor of 4. 4+6=10

2.

a. How do you represent natural numbers in logic programming? Mark the axioms.

b. Write any one sorting algorithm in Prolog. 3+7=10

3.

a. Write the following statements in Prolog:

- If it is raining or snowing then there is precipitation.
- If it is freezing and there is precipitation, then it is snowing.
- If it is not freezing and there is precipitation, then it is raining.
- It is snowing.

Answer the queries in Prolog: "Is it raining" and "Is it freezing" Justify. 10

BACHELOR OF COMPUTER SCIENCE AND ENGINEERING

Third Year | First Semester | Class Test I

Principles of Programming Language (Set III)

Time- Fifty Minutes **Full Marks-30**

1.

a. When do we say that a lambda expression is in normal form? What do you mean by normal order?

b. How can you compute factorial of a number in Lambda calculus? Show the steps to calculate factorial of 3. 4+6

2.

a. Write Prolog clauses to express the relationships: cousin, grandparent. Given parent(X,Y) means X is a parent of Y.

b. Write the following statements in first order predicate logic:

- If it is raining or snowing then there is precipitation.
- If it is freezing and there is precipitation, then it is snowing.
- If it is not freezing and there is precipitation, then it is raining.
- It is snowing. 5+5=10

3. State the pros and cons of logic programming. 10