

UNIVERSITY OF RUHUNA

**BACHELOR OF SCIENCE GENERAL DEGREE LEVEL I (SEMESTER I)
EXAMINATIONS – July 2016**

SUBJECT : COMPUTER SCIENCE

COURSE UNIT: COM112β/COM1123 (Programming Techniques)

TIME: 2 Hours

(Answer Four Questions Only)

1.

- a. Describe the purpose of using comments in a Java program and explain how the different types of comments are written in Java?
- b. Using the given declarations and initializations evaluate the following expressions.

```
int j = 10, k=20, n=1 ;  
int x=100, y=200;
```

- i. $(x < y) \parallel (k \neq j)$
 - ii. $((x \leq y) \parallel (k == j)) \&\& !(x < y)$
 - iii. $j \% 4 + n * 2$
 - iv. $++j * n$
 - v. $y/x*k$
- c. Write the following mathematical expressions in Java.

i.
$$p = \sqrt{2 \pi r} + \frac{2^n}{p(m-r)}$$

ii.
$$r = \sqrt{(x-h)^2 + (y-k)^2}$$

- d. Write the exact output produced by the following Java programs.

i. .

```
public class ExamScriptOne {  
  
    public static void main(String[] args) {  
        int i=1,j;  
        while (i<5) {  
            j=1;  
            while (j<4) {  
                System.out.println(i + "," + j + ": ");  
                j++;  
            }  
            System.out.println();  
            i++;  
        }  
    }  
}
```

ii.

```
public class ExamScriptTwo {
    public static void main(String [ ] args) {
        int n=12345;
        int m=0;
        System.out.println("Initial n is " + n);
        while (n!=0) {
            m=(10 * m) + (n % 10);
            n=n/10;
            System.out.println("Intermediate m is " + m);
        }
        System.out.println("Final m is " + m);
    }
}
```

2.

- a. List eight primitive data types and two reference data types used in Java language.
- b. For each of the following Java code segments, determine the value of the **variable sum** after code is executed.

i. .

```
int count = 0, sum = 0;
do {
    sum+=count;
    count++;
} while (count < 10)
```

ii. .

```
int count =1, sum = 0;
while (count < 20) {
    sum += count;
    count +=3;
}
```

iii. .

```
int sum = 0;
for (int i=10; i>0; i=i-2) {
    sum = sum + i;
}
```

- c. Rewrite the following Java program segment using a **while** loop.

```
double sum, rainfall, annualAverage;
sum = 0.0;
Scanner input = new Scanner(System.in);
for (int i = 0; i < 12; i++) {
    System.out.print("Rainfall for month " + (i+1) + ": ");
    rainfall = input.nextDouble();
    sum += rainfall;
}
annualAverage = sum / 12.0;
```

- d. Write a Java program that replies either Leap Year or Not a Leap Year, when a year given as keyboard input. A year is a Leap Year if the year can be divided by 4 but not by 100 (e.g. 1796). A year that can be divided by both 4 and 100 is Leap Year if it can also be divided by 400.

3.

- a. Explain why arrays are important for programming languages. Briefly describe features of a Java one dimensional array using the following declaration.

```
int[] marks = new int[10];
```

- b. Consider the following array code and answer the questions in b(i) and b(ii) below.

```
int index;
int[] data = new int[10];
for (index = 0; index <= data.length-1; index++) {
    data[index] = index*index;
```

- i. What are the values in the array "data" after executing the above code?
ii. What are the values in the array "data" after executing the following code?

```
for (index = 0; index <= data.length-1; index++) {
    data[index] = data[data.length-index-1];
```

- c. Rewrite the following if-else statement using **switch** statement.

```
if ( option == 1)
    vehicle = "Motor Cycle";
else if (option ==2)
    vehicle = " Car ";
else if (option == 3) || ( opting == 4)
    vehicle = "Heavy Vehicle";
else if ( option == 5)
    vehicle = "Three Wheel";
else
    vehicle = "Invalid Option";
```

- d. Write a Java program to read marks of ten students for a particular subject into an array and display the following report (**Marks Report**). The grade should be calculated as follows.

Marks	Grade
70-100	A
55-69	B
40-54	C
30-39	D
0-29	E

Student	Marks	Grade
1	40	C
2		
3
4		
5		
6	55	B
7		
8
9		
10	80	A
Class Average	60.76	

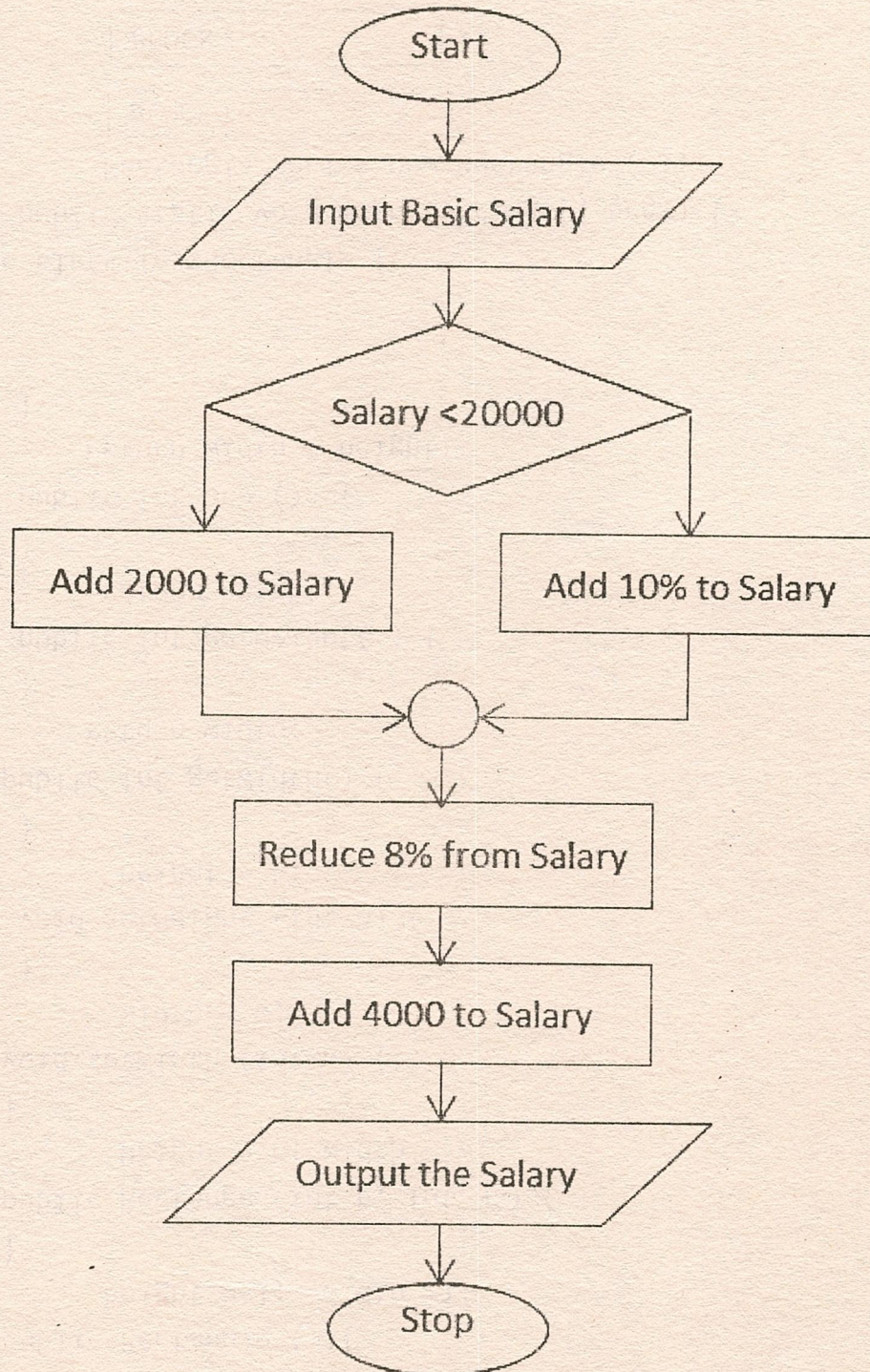
Marks Report

4.

- a. Explain the **binary search** algorithm by using a suitable method.
- b. A working Java program is scrambled as given in the **code pool** column in the table below. Reconstruct the code segments in code pool to make a working Java program that produces the output given in the **output screen** column in the table. You may place curly brackets as required to complete the code.

Code Pool	Output Screen
<pre> for (i=0; i < marks.length-1; i++) System.out.println(marks[i]); int[] marks = { 60, 10, 30,5, 90, 70,20, 80, 40, 25}; for (i = 0; i < marks.length-2 ; i++) public static void main(String[] args) public class MySort if (marks[j] < marks[i]) int i, j; int temp; for (j = i + 1; j < 10; j++) marks[j] = marks[i]; marks[i]= temp; temp = marks[j]; </pre>	<pre> >java MySort 5 10 20 25 30 40 60 70 80 90 </pre>

- c. The flow chart given below show how monthly salaries of employees calculated based on their basic salaries. Considering the flow chart write a Java program to calculate monthly salary of employees in the organization.



5.

- Explain two advantages of using *methods* in a programming language.
- Explain the difference between **instance variable** and **class variable** in Java using a suitable method.
- Write five features of **constructors** used in Java programming.

d. Investigate the following Java code and answer the questions given below.

```
public class Rectangle {
    private int height;
    private int width;
    public Rectangle ( ){
        height = 1; width =1;
    }
    public Rectangle (int h, int w ) {
        height = h; width = w;
    }
    void setWidth (int w) {
        width = w;
    }
    void setHeight (int h) {
        height = h;
    }
    public int getWidth() {
        return width;
    }
    public int getHeight( ) {
        return height;
    }
    public int are () {
        return width * height;
    }
}

public class TestRectangle {
    public static void main (Strings[] args) {
        . Rectangle rec1 = new Rectangle ( );
        BLOCK 1
        BLOCK 2
        BLOCK 3
        BLOCK 4
    }
}
```

- i. Write eight keywords used in the above program.
- ii. Write name of the classes used in the above program.
- iii. How many constructor methods are in the program?
- iv. Write the names of the primitive variables in the program.
- v. Write the names of the reference variable in the programs.
- vi. Write four Java statements in side BLOCK 1, BLOCK 2, BLOCK 3 and BLOCK 4 to respectively satisfy four requirements given below.
 - **Requirement 1:** Set the width to 10 and height to 5 of the rec1 object.
 - **Requirement 2:** Display the area of the rec1 Rectangle object.
 - **Requirement 3:** Create a rec2 rectangle object with height 10 and width 20.
 - **Requirement 4:** Display the width of the rec2 object.
- vii. Write new instance method with the name perimeter to calculate the perimeter of the rectangle and return the value.