

# QUALITATIVE ANALYSIS

## SECTION A (40 Marks)

*Attempt all questions*

### Question 1

- (a) What is inheritance? [2]
- (b) Name the operators listed below: [2]
- (i) <
  - (ii) ++
  - (iii) &&
  - (iv) ? :
- (c) State the number of bytes occupied by **char** and **int** data types. [2]
- (d) Write one difference between / and % operator. [2]
- (e) String x[] = {"SAMSUNG", "NOKIA", "SONY", "MICROMAX", "BLACKBERRY"}; [2]
- Give the output of the following statements:
- (i) System.out.println(x[1]);
  - (ii) System.out.println(x[3].length ( ));

## Comments of Examiners

- (a) In many cases, candidates were unable to include important keywords like ‘super class’, ‘sub class’, ‘base class’ or ‘derived class’ etc., while explaining the term ‘inheritance’. A few candidates just mentioned ‘sharing properties’ or wrote examples without any explanation.
- (b) Most candidates answered correctly. However, some candidates confused relational operator with logical operator.
- (c) Majority of candidates did not read the question properly and wrote the size of data types in terms of bits instead of bytes.
- (d) Most candidates answered this question correctly. However, some were unaware about the purpose of %(modulus) operator and wrote that it is a percentage symbol.

## Suggestions for teachers

- Important concepts such as inheritance should be explained with real life/ real world examples to make the concept more clear.
- All types of operators should be taught with their proper name and their uses.
- Instruct the candidates to read the question carefully. Data types should be explained with their use and correct memory size.
- Teach the differences between the operators with examples.
- Subscript and subscripted variables must be explained thoroughly with examples.

## MARKING SCHEME

### Question 1

(a)	<b>Inheritance</b> allows a class to use the properties and methods of another class. In other words, the derived class <b>inherits</b> the states and behaviors from the base class. The derived class is also called subclass and the base class is also known as super-class OR Inheritance is the process by which one object acquires the properties of another object.
(b)	(i) relational operator (ii) unary increment operator (iii) logical operator (iv) ternary or conditional operator
(c)	char – 2 bytes , int – 4 bytes
(d)	/ – It is a division operator. It gives the quotient. % – It is a modulus operator. It gives the remainder.
(e)	NOKIA 8

## Question 2

(a) Name the following: [2]

(i) A keyword used to call a package in the program.

(ii) Any one reference data type.

(b) What are the two ways of invoking functions? [2]

(c) State the data type and value of **res** after the following is executed: [2]

```
char ch='t';
```

```
res= Character.toUpperCase(ch);
```

(d) Give the output of the following program segment and also mention the number of times the loop is executed: [2]

```
int a,b;
```

```
for (a = 6, b = 4; a <= 24; a = a + 6)
```

```
{
```

```
    if (a%b ==0)
```

```
        break;
```

```
}
```

```
System.out.println(a);
```

(e) Write the output: [2]

```
char ch = 'F';
```

```
int m = ch;
```

```
m=m+5;
```

```
System.out.println(m + " " + ch);
```

## Comments of Examiners

- (a) Most candidates answered the first part of the question correctly. Some candidates wrote the first character of the keyword *import* in uppercase. Many candidates wrote examples of primitive data type instead of reference data type.
- (b) Most candidates answered correctly. However, a few candidates were not aware of ‘pass by value’ and ‘pass by reference’ concepts.
- (c) Many candidates identified the data type but while writing the answer committed errors. They wrote the term character/ Character instead of char.
- (d) Most candidates gave the output of the given program segment correctly and mentioned the number of times the loop is executed correctly. Some candidates however, were not clear about the concept of loop and use of *break* within the loop.
- (e) A few candidates answered as m+5 F. ASCII codes were not known by the candidates. The type conversion from *char* to *int* was also not clear to the candidates.

### Suggestions for teachers

- Reason out the purpose of keywords and case sensitivity of the language.
- Topic Function must be given more importance to make the students understand the topic.
- Return data type of every library function should be taught clearly. More practice questions should be given to the students.
- Explain the use of *break* statement with examples. More effort should be taken to make the students learn the ASCII values.
- Explain the different types of type conversion with examples.

## MARKING SCHEME

### Question 2

(a)	(i) import (ii) class / array / String/ interface
(b)	(i) Call by value OR Pass by value (ii) Call by reference OR Pass by reference
(c)	char & T
(d)	Output: 12, Loop is executed two times.
(e)	75 F

### Question 3

- (a) Write a Java expression for the following: [2]  
 $ax^5 + bx^3 + c$
- (b) What is the value of **x1** if  $x=5$ ? [2]  
 $x1 = ++x - x++ + --x$
- (c) Why is an object called an instance of a class? [2]
- (d) Convert following *do-while* loop into *for* loop. [2]  

```
int i = 1;
int d=5;
do {
    d=d*2;
    System.out.println(d);
    i++; } while ( i<=5);
```
- (e) Differentiate between constructor and function. [2]
- (f) Write the output for the following: [2]  

```
String s="Today is Test" ;
System.out.println(s.indexOf("T"));
System.out.println(s.substring(0,7) + " " + "Holiday");
```
- (g) What are the values stored in variables **r1** and **r2**: [2]  
(i) `double r1 = Math.abs(Math.min(-2.83, -5.83));`  
(ii) `double r2 = Math.sqrt(Math.floor(16.3));`
- (h) Give the output of the following code: [2]  

```
String A ="26", B="100";
String D=A+B+"200";
int x= Integer.parseInt(A);
int y = Integer.parseInt(B);
int d = x+y;
System.out.println("Result 1 = "+D);
System.out.println("Result 2 = " +d);
```
- (i) Analyze the given program segment and answer the following questions: [2]  

```
for(int i=3;i<=4;i++ ) {
    for(int j=2;j<i;j++ ) {
        System.out.print(" ");
    }
    System.out.println("WIN" );
}
```

  
(i) How many times does the inner loop execute?  
(ii) Write the output of the program segment.
- (j) What is the difference between the Scanner class functions *next()* and *nextLine()*? [2]

## Comments of Examiners

- (a) This question was correctly answered by most candidates. Some candidates wrote syntax of `Math.pow()` as `Math.pow(ax, 5)` instead of `a*Math.pow(x,5)`.
- (b) Many candidates answered this question correctly. Some candidates wrote the correct answer without showing the working. Some candidates did not have any idea of post and pre-increment or decrement operators, change of self-value was not very clear, as a result they miscalculated the value of 'x' as 6 or 5.
- (c) Only few candidates gave the correct answer. The concept of object and class was not clear to many candidates. In some cases, the reason was not clear and vague answers were given.
- (d) Although some candidates attempted this part well, there were candidates who were confused with the multiple initialization in the question and wrote improper *for* loop.
- (e) Although many candidates differentiated between constructor and function correctly, there were some who were unable to write the correct answer.
- (f) A few candidates wrote the correct answer. The concept of string and usage of string functions were not clear to many candidates.
- (g) Many candidates answered this question correctly. Some candidates were not able to identify the return type of Math function and wrote the wrong answer as 4 instead of 4.0.
- (h) Several candidates were not aware of string concatenation using '+' operator and wrote incorrect answers such as 326.
- (i) Only few candidates wrote the correct answer. The concept of nested loop was not clear to many candidates. In some cases, horizontal output was given instead of vertical.
- (j) Some candidates got confused with the Scanner class functions `read()` and `readLine()` with `print()`, `println()` and gave vague answers .

## Suggestions for teachers

- The difference between an arithmetic expression and expression used in the computer should be clarified. Lot of practice on similar type of questions should be given in the class room.
- Difference between postfix and prefix notations should be taught clearly with examples. Give practice of calculations involving postfix and prefix operators.
- While explaining any topic, elaborate on it with the help of examples and reasoning.
- More practice should be given in conversion from one loop structure to another.
- Explain the use of constructor in the context of creation and initialization of an object. Also the topic functions must be taught in detail.
- Familiarize students with all the different Mathematical functions given in the syllabus and make students try these functions on the computer.
- Explain the String concatenation '+' operator and stress upon the context in which it is used. Give practice questions on how to convert a numeric string into a numeric value using methods of wrapper class.
- Practice should be given in using nested loops. Show the dry run / working of the program before students try these types of programs on the computer.
- Scanner class concept must be explained with advantages and examples. Using Scanner class functions for input will help the students, answer such questions correctly.

## MARKING SCHEME

### Question 3

(a)	$a * \text{Math.pow}(x,5) + b * \text{Math.pow}(x,3) + c$ [OR] $a * (x * x * x * x * x) + b * (x * x * x) + c$
(b)	$x1 = 6$
(c)	An object is based on the blueprint as specified by the class or the copy of the class, every object of a class reserves the memory of the same capacity of that of a class.
(d)	<pre>for (int i = 1 ,d=5; i&lt;=5 ; i++) {     d= d*2;     System.out.println(d); }</pre>
(e)	<p><b>Constructor:</b>  It is a function which is having same name as class name.  It has no return type, not even void data type.  It is invoked automatically as soon as the object of the class is created.  It has two types: default and parameterised.  It creates instance of class.</p> <p><b>Function:</b>  It is always defined by any name except keyword.  It has void or a valid return data type.  It must be called by using object of the class or directly.  It has two types: call by value and call by reference  It contains one or more executable statements.</p>
(f)	0 Today i Holiday [OR] Today Holiday
(g)	(i) 5.83  (ii) 4.0
(h)	Result 1= 26100200  Result 2=126
(i)	(i) 3 (ii) WIN WIN
(j)	next() – accept a string without any space/Accepts a word / terminates the input of characters when a space is met  nextLine() – accepts a string with the space / accepts a sentence .

## SECTION B (60 Marks)

*Attempt any four questions from this Section*

### Question 4

Define a class **Electric Bill** with the following specifications:

[15]

class \_\_\_\_\_ : ElectricBill

Instance variables / data member:

String n – to store the name of the customer

int units – to store the number of units consumed

double bill – to store the amount to be paid

Member methods:

void accept( ) – to accept the name of the customer and number of units consumed

void calculate( ) – to calculate the bill as per the following tariff:

<u>Number of units</u>	<u>Rate per unit</u>
First 100 units	Rs.2.00
Next 200 units	Rs.3.00
Above 300 units	Rs.5.00

A surcharge of 2.5% charged if the number of units consumed is above 300 units.

void print ( ) - To print the details as follows:

Name of the customer: .....

Number of units consumed: .....

Bill amount: .....

Write a main method to create an object of the class and call the above member methods.

## Comments of Examiners

Numerous types of errors were committed in this question by many candidates, namely:

- (i) Used a different class name other than the one given in the question.
- (ii) A single function was used instead of the ones asked for in the question.
- (iii) Instance variables were not declared in the proper place.
- (iv) Calculation of bill amount for units above 300 was incorrect.
- (v) Surcharge calculation was not done properly.
- (vi) Syntax errors in the object creation and function call statement.

## Suggestions for teachers

- Teach students to write programs involving multiple functions.
- Explain the purpose of instance variable and difference between instance variable and local variable.
- Instruct the students to use the class name, etc., as given in the question.
- Slab rate calculation should be explained properly and enough practice should be given.
- How to create an object and invoke the function using the object needs to be explained thoroughly and practiced properly.

## MARKING SCHEME

### Question 4

```
import java.util.*;
public class ElectricBill    {
int units;
String n;
double bill;
Scanner ob = new Scanner (System.in);
void accept()                {
System.out.println("Enter Name of the customer");
n=ob.next();
System.out.println("Enter Number of units consumed");
units=ob.nextInt();         }
void calculate()             {
```

```

if (units<=100)
bill=units*2;
else
if (units >100 && units <=300)
bill=100*2+(units-100)*3;
else
bill=100*2+200*3+(units-300)*5;
if (units>300)
bill=bill+2.5/100*bill; }
void print()      {
System.out.println("Name of the
customer:"+n);

System.out.println("Number of Units consumed :"+units);
System.out.println("Bill Amount :"+bill);      }
public static void main(String args[]) {
    ElectricBill  obj=new ElectricBill();
        obj.accept();
        obj.calculate();
        obj.print(); } }

```

<i>STEPS</i>
class name
Declaration of variables
void accept()
Two inputs
void calculate()
Calculation of bill amount ( 3 conditions With 3 calculations)
Calculation of surcharge with condition
void print()
Three Outputs
Object creation
Variable description /Mnemonic codes

## Question 5

[15]

Write a program to accept a number and check and display whether it is a **spy number** or not. (A number is spy if the sum of its digits equals the product of its digits.)

Example: consider the number 1124, Sum of the digits = 1 + 1 + 2 + 4 = 8

Product of the digits = 1 × 1 × 2 × 4 = 8

## Comments of Examiners

Many candidates answered this question correctly. Common errors observed were:

- (i) Used the value given as example in the question instead of accepting the value from the user.
- (ii) Variable used to store sum and product were not initialized or both were initialized to 0.
- (iii) Assignment operator (=) was used to compare two integer values instead of comparison operator(==).
- (iv) Confusion in use of division and modulus operator.

### Suggestions for teachers

- Instruct the students to read the question carefully.
- Adequate practice should be given to students on the program using extraction of digits.
- Differences between the commonly used operators (= & ==) should be made clear in the class room.

## MARKING SCHEME

### Question 5

```
public class SpyNumber
{
void print (int n)
{

int i, s=0, p = 1,d;
while (n>0)
{
d=n%10;
n=n/10;
s+=d;
p*=d;
}
if (s==p)
System.out.println( "It is a spy number");
else
System.out.println( " It is not a spy number");
}
}
```

<i>STEPS</i>
Input
Declaration of variables
Initialization of variables s=0 & p=1
Loop
Extraction of digit
Updation
Sum
Product
Check
Output
Variable description

## Question 6

Using *switch* statement, write a menu driven program for the following:

- (i) To find and display the sum of the series given below:

$$S = x^1 - x^2 + x^3 - x^4 + x^5 \dots \dots \dots - x^{20}$$

(where  $x = 2$ )

- (ii) To display the following series:

1 11 111 1111 11111

For an incorrect option, an appropriate error message should be displayed.

### Comments of Examiners

A number of candidates misunderstood the question and wrote two separate programs. Some of the commonly made mistakes were:

- (i) Value of variable 'x' was accepted instead of assigning.
- (ii) Printed the second series directly using print () statement.
- (iii) In some cases, *break* statement was missing and the first letter of *default* statement was in capital letter.

### Suggestions for teachers

- Sufficient practice must be given on writing menu – driven programs.
- Teach students when *double* data type should be used and how to initialize it with default values.
- Importance of *break* and *default* statements in *switch* structure should be explained clearly.

## MARKING SCHEME

### Question 6

```
import java.util.*;
class series {
public static void main(String arg[]) {
```

```
System.out.println("1.series_1    2.series_2  ");
```

```
Scanner sc=new
Scanner(System.in);
System.out.println("enter your
choice");
int choice=sc.nextInt();

switch(choice) {
case 1: double sum=0.0;
int x=2;
for (int i=1;i<=20;i++)
{
if (i%2==0)
sum =sum-Math.pow(x,i);
else
sum =sum+Math.pow(x,i);
}
System.out.println("sum is "+sum);
break;
case 2 : int s=0;
for(int i=1 ;i<=5 ;i++)
{
s=s*10+1 ;
System.out.print(s + " ");
}
break;
default :System.out.println("invalid choice");
}
}
}
```

<i><b>STEPS</b></i>
Display of menu
Choice input and switch(choice)
Case 1 : Declaration and Initialisation of variables sum and x
for loop
if else and sum calculation
Displaying sum
Case 2 : Declaration and initialization of variable s
for loop
Calculation of s
Display of s
default
Variable description

## Question 7

Write a program to input integer elements into an array of size **20** and perform the following operations:

- (i) Display largest number from the array.
- (ii) Display smallest number from the array.
- (iii) Display sum of all the elements of the array.

### Comments of Examiners

Most candidates answered correctly. However, few general mistakes were observed:

- (i) Syntax error in declaring or creating an array.
- (ii) Array elements were not accepted from the user but assigned.
- (iii) Initialization of the variables max, min, and sum were not done properly. Some candidates initialized the variables within the loop.
- (iv) loop was not formed correctly.  
(for i=0;i<=20;i++)

### Suggestions for teachers

- Array creation with different data types should be practiced.
- Inputting and storing elements in an array should be practiced on computer.
- Importance of initialization of variables appropriately should be taught clearly.
- Concept of array index to be taught clearly.

## MARKING SCHEME

### Question 7

```
import java.util.*;
class array
{
public static void main(String arg[])
{
Scanner sc =new Scanner(System.in);
System.out.println("enter numbers");
int a[ ]=new int [20];
for(int i=0;i<20;i++)
{
a[i]=sc.nextInt();
}
int max=a[0];
int min=a[0];
int sum= 0;
for(int i=0;i<20;i++)
{
if( a[i]>max)
max = a[i];
if(a[i]<min)
min=a[i];
sum=sum+ a[i];
}
System.out.println("largest number is"+ max);
System.out.println("smallest number is"+min);
System.out.println("sum is "+ sum);
}
}
```

<i>STEPS</i>
Creating an array
Loop for input
Taking input of array elements
Initialization of max and min
for loop
if condition and updating the value of max variable
If condition and updating the value of min variable
calculating sum of array elements
Display
Variable description

## Question 8

[15]

Design a class to overload a function check( ) as follows:

- (i) void check (String str , char ch ) - to find and print the frequency of a character in a string.

Example:

Input:

str = "success"

ch = 's'

Output:

number of s present is =3

- (ii) void check(String s1) - to display only vowels from string s1, after converting it to lower case.

Example:

Input:

s1 ="computer"

Output: o u e

### Comments of Examiners

Common mistakes observed were:

- (i) Few candidates used separate programs or two functions with different names.
- (ii) Functions were called without passing required arguments and accepted values as inputs inside the function body.
- (iii) Counter variable was not declared and initialized as 0. In some cases, counter was not incremented.
- (iv) Conversion of string into lowercase was not done.
- (v) Single quotes were missing in character literals a,e,i,o,u .
- (vi)String function charAt() was used without a String object.

### Suggestions for teachers

Programs using function overloading should be practiced more. Avoid using only main functions for all programs. Programs on multiple functions of all types to be revised on a consistent basis.

- Passing arguments through function must be worked out while teaching.
- String functions and their uses need to be taught thoroughly.
- More practice should be given on string related functions.

## MARKING SCHEME

### Question 8

**class overload**

```
{
public static void check(String s ,char ch)
{
int c=0;
for(int i=0;i<s.length();i++)
{
if(s.charAt(i)==ch)
c++;
}
System.out.println("number of "+ ch+ " present is="+c);
}
public static void check(String s1)
{
s1=s1.toLowerCase();

for(int i=0;i<s1.length();i++)
{
char ch = s1.charAt(i);
if (ch=='a'||ch=='e'||ch=='i'||ch=='o'||ch=='u')
System.out.print(ch+" ");
}
}
public static void main(String arg[])
{
check("success", 's');
check("computer");
}
}
```

#### *STEPS*

void check (string S, char ch)
Initialization and incrementation of counter c
loop
Check
Output
void check (String s1)
Convert to lower case
Loop
Extraction
Check
display ch
Variable description

## Question 9

[15]

Write a program to input **forty** words in an array. Arrange these words in descending order of alphabets, using **selection** sort technique. Print the sorted array.

### Comments of Examiners

Common mistakes observed were:

- (i) Integer array was declared instead of String array.
- (ii) Most candidates made Syntax error in declaration of an array.
- (iii) Declaration of temporary variable as an integer type instead of String type.
- (iv) Some candidates gave incorrect limits for inner and outer loops.
- (v) compareTo() method was not used.
- (v) Used other methods of sorting instead of Selection sort.
- (vi) Array elements were sorted in ascending order in place of descending order.
- (vi) Printing of sorted elements was not done.

### Suggestions for teachers

- Revise iteration before teaching arrays.
- Explain the importance of the loop variable to the array as its subscript.
- Basic technique such as searching and sorting should be taught with different data types.
- Use of compareTo() method should be explained with examples.
- Difference between bubble sort and Selection should be explained thoroughly.

## MARKING SCHEME

### Question 9

```
public class Selection
{
String m[]=new String[40];
Selection(String z[])
{
m=z;
```

```

}
void sort()
{
int i, p, j; String s,t;
for (i=0;i<40;i++)
{
s=m[i];
p=i;
for (j=i+1;j<40;j++)
{
if (m[j].compareTo(s)>0)
{
s=m[j];
p=j;
}
}
t=m[i];
m[i]=m[p];
m[p]=t;
}
for (i=0;i<40;i++)
System.out.println(m[i]);
}
}

```

<i><b>STEPS</b></i>
Array declaration
Input
Dec variation
Loop
Assign m[i] & i
Inner loop
Check
Assign
Swap
Output
Variable description

## GENERAL COMMENTS

### Topics found difficult/ confusing by candidates

- Data types and their sizes
- Calculation of bill amount and surcharge
- Output of program code using nested loop
- Invoking functions with object
- Sorting strings
- Classification of operators
- Objects and instance of a class
- Concatenation of strings and spaces using '+' operator
- Sorting techniques
- Usage of library function, substring () and Math.min()
- Output of program code using nested loop
- Index of an array
- print()/println()
- next()/nextLine()
- Converting numeric string into an integer value.

### Suggestions for candidates

- Utilize the reading time to clearly understand the nature of the question.
- All definitions should be understood and learnt.
- Try to understand the question asked.
- Learn the correct use of all statements so that syntax errors can be eliminated.
- Each concept should be understood instead of rote learning.
- Practice questions based on output finding programs.
- Do not study definition of terms and their related examples as separate from problem solving techniques.
- Concepts should be applied in the program for better understanding.
- Apply simple logic in a program to get the desired output.
- Do not memorize the program, try to understand the logic.
- Use Mnemonic variables and comments to explain the programs.
- Apart from text book learning, look up other reliable resources to gather comprehensive knowledge of the subject.