

Shreyas
6/17

Time: Three hours

Maximum marks: 70

Instructions:

- * Answers to this paper must be written on the answer script provided separately.
- * You will **not** be allowed to write during the first 15 minutes. The time is to be spent in reading the question paper.
- * All subsections of each question must be answered in the correct order.
- * All working including rough work should be done on the same sheet as the rest of the answer.
- * Please do not write anything on the question paper except your name and roll number.
- * The intended marks for questions or parts of questions are given in brackets [].
- * Answer **all** the questions from **Part I** and **six** questions from **Part II** choosing **two** questions from **Section A**, **two** questions from **Section B** and **two** questions from **Section C**.

PART I [20 marks]

Attempt **all** questions from this Part.

While answering questions in this part, indicate briefly your working and reasoning wherever required.

Question 1

Answer the following questions:

- (a) What is an instruction cycle? [1]
- (b) Explain cache memory. [1]
- (c) Define spamming. [1]
- (d) What will be the value of expression $\text{Math.ceil}(2.3) + \text{Math.floor}(-9.9)$ in Java? [1]
- (e) $\text{float } a = 4.5;$ will this expression work in Java or not? Explain. [1]

3 + (-10)

Question 2

- (a) What is the difference between primitive and user defined data types? [2]
- (b) Convert $(ABC)_{16} \rightarrow ()_8$ [2]
- (c) Convert $(34.45)_{10} \rightarrow ()_2$ (up to 3 decimal places) [2]
- (d) Write any two differences between switch and if statement of Java. [2]
- (e) Write any two functions performed by an operating system. [2]

Question 3

(a) What will be the value of variable q after the following code executes? Show dry run / working:

[3]

```
int q = 0, m, n;
for(n = 2; n <= 3; n++)
```

```
{
  for(m = 1; m <= n; m++)
```

```
{
  int p = m + n - 1;
```

```
  if(p % 3 == 0)
```

```
    q += p;
```

```
  else
```

```
    q += p + 4;
```

```
}
```

```
}
```

(b) The following is a function of some class which counts the number of even digits present in a positive integer. The function does not use modulus (%) operator to extract digits. There are some places in the code marked ?1?, ?2?, ?3? and ?4? which may be replaced by a statement / expression so that the function works correctly.

```
int count(int n)
```

```
{
```

```
  int c = ?1?; c = 0
```

```
  while(n > 0)
```

```
  {
```

```
    int f = n / 10;
```

```
    int s = ?2?;
```

```
    int digit = n - s;
```

```
    if(digit % 2 == 0)
```

```
      ?3?;
```

```
    n = ?4?;
```

```
  }
```

```
  return c;
```

```
}
```

- (i) What will be the value or expression at ?1?
- (ii) What will be the value or expression at ?2?
- (iii) What will be the value or expression at ?3?
- (iv) What will be the value or expression at ?4?

[2]

~~2016~~

~~4582~~

12
 458

even digit

458

PART II [50 marks]

Answer any six questions in this part choosing two from Section A, two from Section B and two from Section C.

SECTION A [20 marks]

Attempt any two questions from this Section. All questions carry equal marks.

Question 4

- (a) Solve $(101010)_2 - (11001)_2$ using one's complement method. [2]
- (b) Calculate $(AB13A)_{16} + (134A7)_{16} = (\quad)_{16}$ [2]
- (c) Write any four rules for declaring identifiers in Java. [2]
- (d) Write any two differences between data bus and address bus. [2]
- (e) Write any two email etiquette. [2]

Question 5

- (a) Solve $(110100)_2 / (111)_2$ [2]
- (b) Solve $(111011)_2 + (701)_8 + (3F)_{16} = (\quad)_2$ [2]
- (c) What is booting? Name the types of booting. [2]
- (d) How is ordinary compilation process different from Java compilation? [2]
- (e) What is the role of Accumulator and Program Counter register? [2]

Question 6

- (a) Solve $(110101)_2 - (111101)_2$ using two's complement method. [2]
- (b) Solve $1204_{(8)} - 743_{(8)}$ [2]
- (c) Define (i) Polymorphism (ii) Data abstraction. [2]
- (d) Write two differences between primary memory and secondary memory. [2]
- (e) What is the significance of (i) Taskbar and (ii) Recycle bin in Windows? [2]

SECTION B [20 marks]

Attempt any two questions. Each program should be written in such a way that it clearly depicts the logic of the problem. This can be achieved by using mnemonic names and comments in the program. (Flowcharts and Algorithms are not required)

Question 7

Design a class Numb with the following details:

Class name : Numb

Data member:

n : to store an integer.

Member functions:

- Numb(int m) : constructor to initialize n by m. Assume that m contains a positive number having 3 digits or more
- int sumfirstlast(int x) : returns the sum of the first and the last digit of x
- int sumexpfirstlast(int x) : returns sum of all the digits of x except first and last
- void check() : invokes the above functions and if the sum of the first and last digits of n is equal to the sum of the remaining digits then prints "SUCCESS" else prints "FAILURE".

Specify the class Numb giving details of the constructor and other methods. Write the main function to create an object of the class and call the functions accordingly to enable the task.

[10]

Question 8

Class Binary contains an array of n integers ($n \leq 100$) that are already arranged in ascending order. The subscripts of the array elements vary from 0 to $n - 1$. The data members and member functions of class Binary are given below:

Class name : Binary

Data members:

- A[] : integer array of 100 elements
- n : size of the array
- l : location of the lower bound
- u : location of the upper bound.

Member functions:

- Binary(int nn) : constructor to initialize the size n to nn and the other instance variables
- void readdata() : to fill the elements of the array in ascending order
- int binary_search(int v) : returns the location of the value (v) to be searched in the list using binary search method. It returns -1 if the number is not present in the given list
- void display() : invokes binary_search() function and displays the position of the number searched if found, else displays "Failed".

Specify the class Binary giving details of the constructor, void readdata(), int binary_search(int) and void display(). Write the main function to create an object of the class and call the functions accordingly to enable the task.

[10]

Question 9

Design a class Change that calculates different sums of the array elements with the following details:

Class name	:	Change
Data members:		
n[] []	:	double dimension integer array
m	:	size of the array (m × m).
Member functions:		
Change(int size)	:	constructor to assign m = size and create the array
void fillarray()	:	accepts numbers in the array n[] []
int sumdigit(int x)	:	returns sum of the digits of an integer x (e.g. if x = 324 then it will return 9 i.e. 4 + 2 + 3)
int sumdiagonal()	:	returns sum of those elements of primary diagonal of the array n[] [] whose sum of digits is odd
void display()	:	displays the array n[] [] in matrix form and sum of those diagonal element whose sum of digits is odd by invoking sumdiagonal().

Specify the class Change giving details of constructor and methods, void fillarray(), int sumdigit(int), int sumdiagonal() and void display(). Write the main function to create an object of the class and call the functions accordingly to enable the task.

[10]

SECTION C [10 marks]

Attempt any two questions. Each program should be written in such a way that it clearly depicts the logic of the problem step wise.

This can also be achieved by using comments in the program and mnemonic names or pseudo codes for algorithms. The program must be written in Java and the algorithms must be written in general / standard form, wherever required. (Flowcharts are not required).

Question 10

Define a class Wages to compute the monthly wages of the worker. The details of the class are given below:

Class name	:	Wages
Data members:		
Name	:	to store the name of the worker
Basic	:	to store the basic pay in decimal
Hrs	:	stores the hours worked during overtime
Rate	:	stores rate per hour for overtime work
Wage	:	stores the overall wage of the worker.

Member functions:

- Wages(...) : parameterized constructor to assign values to the instance variables
- double overtime() : calculates and returns the overtime amount as (hours × rate) ,
- void display() : calculates the wage using the formula wage = overtime amount + basic pay and displays it along with other details.

Specify the class Wages giving details of the constructor(), double overtime() and void display(). The main function need not be written. [5]

Question 11

Define a class Find with the following details:

Class name : Find

Data member:

lim : stores limit.

Member functions:

Find(int m) : constructor to initialize lim by m

boolean iscomposite(int x) : returns true if x is a composite number else returns false (numbers having more than two factors are composite numbers)

void sumcomposite() : prints sum of all composite numbers from 1 to lim.

Specify the class Find giving details of the constructor Find(int), boolean iscomposite(int) and void sumcomposite(). You need not write the main() function. [5]

Question 12

Write an algorithm to enter a number and print the smallest digit of the number. [5]

For example: if the number entered is 34526
then the output will be 2.

```
int n = sc.nextInt();
int s = n / 10;
for (int i = 1; i <= n; i++)
{
    d = n / 10;
    if (s < d)
        s = d;
}
```