

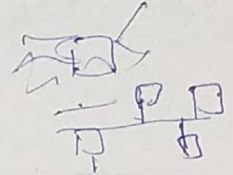
**CBCS for PG Programme (SEM-II) EXAMINATIONS - 2019**  
**Operating System and Shell Programming**

040/519

Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.



1. (a) What is a system call? Discuss the system calls used in process control management.

(b) Distinguish between the client-server and peer-to-peer models of distributed systems.

(c) Briefly discuss the services and functions provided by an operating system in connection with the storage management.

2. (a) Processes can be cooperating and non-cooperating. Specify the communication mechanism used by the cooperating processes.

(b) Consider the set of any four processes, with the length of the CPU burst (8, 4, 9, 5) and arrival time (0, 1, 2, 3) given in milliseconds. Draw a Gantt chart that illustrate the execution of these processes using shortest-remaining-time-first scheduling. Also, calculate turnaround time of each process. 17, 4, 24, 17.

1045 (c) Is the following system of four processes with 2 resources and their instances deadlocked? Current allocation matrix: p1 (1, 3), p2 (4, 1), p3 (1, 2), p4 (2, 0); Current request matrix: p1 (1, 2), p2 (4, 3), p3 (1, 7), p4 (5, 1) and Availability Vector (1, 4).

(a) Describe page-based virtual memory technique. Illustrate the procedure used to map a logical address into a physical address.

(b) Consider the following page reference strings: 1, 2, 3, 4, 3, 2, 1, 5, 2, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for the LRU replacement algorithm, assuming four frames? 17.

(c) Illustrate contiguous memory allocation scheme and its drawbacks.

4 (a) One model of protection in UNIX can be implemented as a matrix. Illustrate and show access matrix of various objects and domains with copy rights and owner rights.

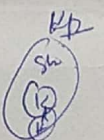
(b) Indexed method of allocating disk space is in wide use. Specify indexed method and its advantages and disadvantages.

04 (c) Write short notes on Trojan horse and viruses.

5. (a) Illustrate three basic data processing concepts used and presented in an AWK script design.

(b) The AWK utility divides patterns into simple and range categories. Discuss each.

(c) Briefly discuss the shells, types of shells and shell programming in UNIX.





Code: CBSE22

Roll No. 18 Dec A054

MCA (Sem-II) Examinations 2018-19

Object-Oriented Programming in C++

Time: 2 Hours

Q.111: ①

Max Marks: 75

- Write your Roll no. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts from each question. All questions carry equal marks.

- (a) List out the advantages and disadvantages of describing a system in terms of objects in Object-Oriented Paradigm.

(b) Explain the differences between passing arguments "by reference" and "by addresses" to functions. Why the reference to an object is passed as argument instead of value in a copy constructor? Explain.

(c) What are input and output streams? Explain the hierarchy of stream classes with a neat diagram.
- (a) Describe the significance of static data members and static member functions in a class with suitable example. Why static members of a class cannot be initialized by constructor of the class?

(b) Explain how new and delete operators manage memory allocation dynamically through a C++ program. Also explain the use of this pointer through an example.

(c) The atoms of different elements have different numbers of protons, neutrons and electrons. Electrons are negatively charged, protons are positively charged, and neutrons have no charge. Write a C++ Program, that includes the definition for an atom class that contains: (i) data members for storing the numbers of protons, neutrons and electrons with appropriate visibility; (ii) setter and getter member functions for manipulating these data members, ensuring that the minimum value for electrons and protons is 1, and the minimum value for neutrons is 0; (iii) a constructor that initializes new objects of atom to be the smallest element (Hydrogen), for which the number of protons is 1, the number of neutrons is 0, and the number of electrons is 1. Include a new member function for the atom class called isIon that will return true or false, depending upon whether the atom is an ion. An atom is an ion if it is charged (i.e., if the number of electrons  $\neq$  the number of protons). Also include a new member function for the atom class called getAtomicMassNumber that will calculate and return the atomic mass number of the atom. Atomic mass number of an atom (often denoted A) is defined as the number of protons plus the number of neutrons.
- (a) What is operator overloading? Write the rules used for overloading operators. Explain, why a friend function cannot be used to overload assignment operator (=)? Write a program to concatenate (join) two objects of class String by overloading '+' operator.

(b) What do you mean by overloading of a function? On what basis, the compiler distinguishes the call of set of overloaded functions having the same name. Write a program to compute the area of a triangle and circle by overloading the area function.

(c) What do you mean by default function arguments? How are they managed in a C++ program? Explain with a suitable example.
- (a) What is inheritance? Mention some advantages of Inheritance. Explain different types of Inheritance with suitable examples. How is the constructor of the base class called using the constructor of the derived class when the parameterized object of derived class is being created?

(b) What is Virtual Function? How run-time polymorphism can be accomplished using virtual functions? Explain with a suitable C++ code.

(c) What is virtual base class? What problem may be encountered in Multiple Inheritance and how is it resolved? Explain with a suitable example.
- (a) Describe the syntax and usage of write(), read(), seekg() and seekp() functions. Write a program in C++ to copy the content of a given file into another file.

(b) What do you mean by Exception handling? Explain how multiple catch statements can be used to handle different exceptions in C++.

(c) What do you mean by Generic Function and Generic Class? What are its advantages? Write a generic function to swap two variables of any type.



Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1. (a) Suppose that there is an empty object 'a' of Array data structure and we want to insert numbers of below series one by one. Write an algorithm (that takes maximum number of movement operations) to insert these numbers into 'a' one by one using its  $insert(x, index)$  function; and also derive the formula to get total number of movements.

1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, ..., n, n, n, n, n.

- (b) Show that product of a diagonal matrix and a lower triangular matrix of same orders is a lower triangular matrix. Let A is an upper triangular matrix and B is a lower triangular matrix of order  $n \times n$ . Write an efficient algorithm to get product of A and B i.e.  $A \times B$ .

- (c) Define the circular linked list and write an algorithm for  $display()$  operation of a circular linked list and illustrate it with an example of circular linked list of 3 nodes.

2. (a) Write a recursive function,  $dsum(n)$ , in mathematical equation form to get the sum of digits of a positive integer and write an algorithm to implement it using stack.

- (b) Convert the following mathematical expression into postfix form directly without using stack. Thereafter, evaluate the obtained postfix expression using stack.

$$((10 - 4) * 5) / (8 - 3 * 2)$$

- (c) Differentiate circular and non-circular queue with suitable example and write an algorithm,  $insert(x)$ , for insertion of an element x in a circular queue.

3. (a) Define complete binary tree with an example. Let h be the height of a complete binary tree and n is number of nodes in it then show that  $2^{h-1} \leq n \leq 2^h - 1$ .

- (b) Draw the expression tree of following mathematical expression and get its postfix and prefix form by traversing the expression tree.

$$(A - B) / (C + D * E) + F$$

- (c) Define the red-black tree. Describe its deletion operation by deleting node with key value 11 of the following red-black tree:

index	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
keys	13	8	17	1	11	15	25		6					22	27
color	B	R	R	B	B	B	B		R					R	R

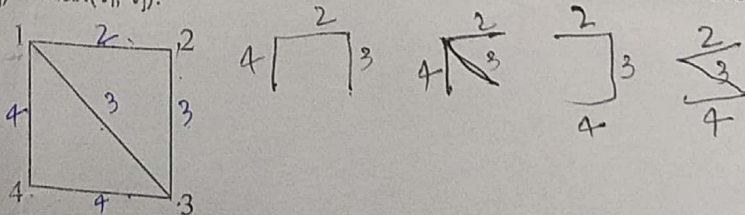
4. (a) Describe in-place sorting and write Shell sort algorithm to sort a list of n integers in non decreasing order.

- (b) What is binary search? Write iterative version of binary search algorithm, in pseudo code, to search an integer x in a sorted list of n integers.

- (c) Let  $H_1(k) = k \% 7$  and  $H_2(k) = k \% 5 + 1$  are first and second hash function respectively. Build the hash table by inserting keys: 1, 15, 8, 29, 19, 9, 14 one by one and collision is resolve using double hashing. Also calculate the total number of collisions.  $\sim 10$

5. (a) Define minimum spanning tree. Draw all possible minimum spanning trees of following graph in which the weight of the edge  $(v_i, v_j)$  is defined as  $w(v_i, v_j) = \max(v_i, v_j)$ .

No. Edges	weight	total MST
1	2	$1 \times 2 \times 2 = 4$
2	3	
2	4	



- (b) What is a cycle graph  $C_n$ ? Determine the number of paths of length three between each vertex pair  $(v_i, v_j)$  of cycle graph  $C_4$  and list all paths of length three from vertex  $v_1$  to vertex  $v_2$ .

- (c) Let  $G = (V, E)$  be a digraph such that  $V = \{v_1, v_2, v_3, v_4\}$ , and  $E = \{<v_1, v_2>, <v_2, v_4>, <v_3, v_2>, <v_4, v_1>, <v_4, v_3>\}$ . Determine whether G is a connected graph using Warshall's algorithm.



Time: 2 hours

Max Marks: 15

Write your Roll no. on the top immediately on receipt of the question paper.

Attempt ALL questions by selecting any ONE part from each. Marks are indicated against each question.

1. (i) Define Array class with `a[]`, `length`, `size` data members and `Array(n = 0)`, `isEmpty()`, `getSize()`, `insert(x, index)`, and `display()` member functions. (6)
- (ii) Write a C/C++ `void storeSeries(Array &a, int n)`, function (that takes minimum number of movement operations) which accept reference of Array class and `n` and store following sequence in object 'a'. Then write a C++ program that read `n`, store the following series in object 'a', print them then remove the duplicate values and again display. (6)  
 $1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, \dots, n, n, n, n, n$
- (iii) Write an efficient C/C++ function, `void product(float a[][], int n, float b[][], int m)`, to get the product of a lower triangular matrix and an upper triangular matrix. Where array `a[][]` stores the lower triangular matrix, array `b[][]` stores the upper triangular matrix, and `n` and `m` are order of these matrices respectively. (6)
- (iv) Define LinkedList class with `create(n)` and `display()` member functions and necessary data members. (6)
- (v) Define Matrix class with `a[][]`, `rows`, `cols` data members and `Matrix(m, n=0)`, `read()`, and `print()` member functions. (6)
- (vi) Define `radixSort()` function, using linked list, to sort the list of positive integers in non decreasing order. (6)
- (vii) Define CircularLinkedList class with first data member and `CircularLinkedList()`, `insert(x, index)`, and `display()` member functions. (6)
- (viii) Define generic stack class using array and implement move function for tower of Hanoi problem using stack. (6)
- (ix) Define generic stack class using array and implement `infixToPostfix()` function to convert infix mathematical expression into equivalent postfix form using stack. (6)
- (x) Define generic CircularQueue class with `isEmpty()`, `size()`, `insert(x)`, `del()` member functions and implement Image component labeling algorithm using queue data structure. (6)
- (xi) Define Tree class with `a[]`, `h` data members and `Tree(h)`, `build(i)`, `inOrder(i)`, `preorder(i)`, `postOrder(i)`, `levelOrder()` member functions. (6)
- (xii) Write a C function to sort list of integers in non-decreasing order using bubble sort algorithm. (6)
- (xiii) Write a C function to sort list of integers in non-decreasing order using selection sort algorithm. (6)
- (xiv) Write a C function to sort list of integers in non-decreasing order using insertion sort algorithm. (6)
- (xv) Write non recursive C function for binary search operation. (6)
- (xvi) Write recursive C function for binary search operation. (6)
- (xvii) Write a C/C++ program that read adjacency matrix of a graph and check whether it is connected or not using Warshall's algorithm. (6)
- (xviii) Write a C/C++ program that read adjacency matrix of a graph and return number of spanning trees. (6)
2. (i) Define AVLTree class with `root` data member and `AVLTree()`, `insert(x)`, `inOrder(r)`, `preOrder(r)`, and `getRoot()` member functions. At the time of insertion operation if it go from balance to unbalance then one of four AVL rotation is to be performed to make it a balance binary search tree. (9)
- (ii) Define BinarySearchTree class with `root` data member and `BinarySearchTree()`, `insert(x)`, `inOrder(r)`, `preOrder(r)`, and `getRoot()` member functions. Each node of this binary search tree stores the key and its frequency. At the time of insertion if a key already exist then its frequency will be increment by one. For example, if we insert keys 10, 5, 10, 20 one by one in an empty binary search tree, then there should be three nodes in this binary search tree, root (with key 10, frequency 2), left child (with key 5, frequency 1), and right child (with key 20, frequency 1). (9)



Code: CSCC24

Roll No. 18meA054

MCA (SEM-II) EXAMINATIONS - 2019  
Microprocessor and Computer Architecture

Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1. (a) Draw the pin diagram of 8085 microprocessor and explain the function of each pin.  
(b) Define addressing modes? With suitable examples explain 8085 addressing modes in detail.  
(c) Explain the sequence of events during the execution of the CALL instruction by 8085 processor with the help of neat timing diagram.

- (a) Write a Program to Perform the following functions and verify the output steps:

- Load the number 5CH in register D
- Load the number 9EH in register C.
- Increment the Contents of register C by one.
- Add the contents of register C and D
- Display the sum at output port 1.

- (b) Specify the contents of the registers and the flag status as the following instructions are executed.

- MVI A, 00H
- MVI B, F8H
- MOV C, A
- MOV D, B
- HLT

- (c) Explain intrasegment and intersegment branch instructions with examples the instructions related to arithmetic and logical shift.

- (a) With the help of neat diagram explain the architecture of 8086 microprocessor in detail. Discuss its flag register.

- (b) What are Software and Hardware interrupts? Which interrupt has the highest priority?

- (c) What are the differences between isolated I/O and memory mapped I/O? What are the advantages and disadvantages of each?

- (d) How many times does the control unit refer to memory when it fetches and executes indirect addressing mode instruction, if the instructions are:

- A computational type requiring an operand from memory. ①
- A branch type. ②

- (b) What must the address field of an indexed addressing mode instruction be to make it the same as a register indirect mode instruction?

- (c) What is RISC and CISC in computer architecture? Differentiate between them.

5. (a) A ROM chip of 1024 X 8 bits has four select inputs and operates from a 5 volt power supply. How many pins are needed for the IC Package? Draw a block diagram and label all input and output terminals in the ROM.

- (b) Derive the logic of one cell and of an entire word for an associative memory that has an output indicator when the unmasked argument is greater than (but not equal to) the word in the associative memory.

- (c) Multiply  $(-7)_{10}$  with  $(3)_{10}$  by using Booth's multiplication. Give the flow table of the multiplication.

1227  
B

A10

B11

1618

SC SC  
9E 9F  
10B 1F  
27



## MCA (SEM-II) EXAMINATIONS – 2019

## Systems Analysis and Design

2504-19

J. J. J.

10/10

Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt all questions selecting two parts from each. All questions carry equal marks.

- (a) Precisely explain the significance of Information System in today's world. Enumerate five prominent applications of information system, and highlight their impact on the society.

(b) Categorically distinguish between predictive SDLC and adaptive SDLC. Mention the characteristics of project due to which you will prefer to apply either of these approaches of SDLC.

(c) What are some of the things an analyst needs to understand about stakeholders? Explain why does he essentially need to do so? Also enumerate skills-set and key traits of a system analyst.
- (a) For any sub-domain of Mess Management System in a student hostel (your choice), Identify strategic, tactical and the operational level decisions (2 for each level), which are to be usually taken by the management. Specify key information needed for each decision.

(b) Suppose that Jamia Millia Islamia University is interested in creating a new course registration system that can support Web-based registration. You, as a senior system analyst suggest 'what the university should consider when determining whether to invest in a custom, packaged, or outsourcing system solution?' Also write down pros and cons of each choice.

(c) Compare advantages and disadvantages of using questionnaire as fact finding technique. Cite an instance of a situation, where questionnaire is a better choice than any other information gathering technique.
- (a) Categorically distinguish between Logical Models and Physical Models, specifically including their purpose and importance in system development. Explain how they facilitate different stakeholders.

(b) Why do you use 'Decision Table' for modeling the requirements during analysis of a project? Discuss the procedure for creating a decision table. Draw a decision table for the following case: -  
*If a candidate is sharp and disciplined, take him as trainee systems analyst. If a candidate is only sharp, take him as trainee programmer. If a candidate is only disciplined, take him as Trainee console operator. If a candidate is neither sharp nor disciplined, reject him.*

(c) Write the rules for balancing a DFD. Draw a DFD to the appropriate level of detail for the following situation: *An advertisement is issued giving essential qualification for the course, the last date for receipt of application, and the fee to be enclosed with the application. A clerk in the registrars' office checks the received application to see if required documents are enclosed and sends valid application to the concerned academic department. The department checks the application in detail and decides the applicants to be admitted, those to be put in waiting list and those to be rejected.*
- (a) What are the key design issues at system design stage? Discuss any one of them in detail.

(b) Mention different aspects of system design. Analyze User Interface Design (UID) importance from various perspectives. List the activities for UID along with their corresponding description.

(c) Why do you need to write good design document? What are its significant benefits? Discuss the structure of design document.
- (a) What do you understand by term "Object-Orientation"? Explain with real life example. Briefly explain how object oriented paradigm reduces the complexity and simplifies software development process.

(b) Explain OMT (Object Modeling Technique) with the help of diagram. Prepare the object diagram for the following situation. *'A directory may contain many other directories and may optionally be contained in another directory. Each directory has exactly one user who is an owner and many users who are authorized to use the directory'.*

(c) Discuss why UML is a popular standard in software industry? List out three fundamental reasons of its popularity. Distinguish between use case and misuse case. Draw one diagram for each of the cases.



MCA (SEM-II) EXAMINATIONS - 2019  
Theory of Computation13-05-19 12:10

Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt any TWO parts from each question and all questions carry equal marks.

1. (a) Describe different types of finite automata along with languages and applications.

(b) Describe and explain the Chomsky hierarchy by stating the production rules of each types of grammar.

(c) Design the deterministic finite automata over  $\Sigma = \{0, 1\}$  which:

- i) Does not accept the string 10101.
- ii) Accepts 11011 as a substring.
- iii) Either accepts string 1110 or string 0101

2. (a) What do you mean by the regular expressions? Design the Finite Automata for the regular expression  $(a/b)^*abb^*$ .

(b) Obtain the grammar and language of the following finite automata:



(c) Prove that regular languages are closed under union, concatenation, Kleen star closure, complementation, and intersection operations.

(a) What do you mean by ambiguity why it occurs and how is it resolved? Also explain the reduced grammar by taking examples.

(b) For the given grammar

 $S \rightarrow (L) \mid a$  $L \rightarrow L, S \mid S$ draw the parse trees for the strings: i)  $((a, a), a, (a))$  ii)  $(a, (a, a))$ 

(c) What do you mean by normal forms of the CFG? Convert the following grammar into CNF:

 $S \rightarrow aSbb \mid bSaa \mid a \mid b.$ 4. (a) What do you mean by PDAs? Design the PDA for the language  $L = \{ww^R : w \in \{0, 1\}^* \text{ and } n \neq 1\}$ .

(b) How a PDA is constructed from CFG and vice versa? Describe the procedure through some example.

(c) Design a PDA for  $L = \{a^n b^{3n} : n \geq 1\}$  and trace the result also by taking some example.5. (a) Define and describe different types of the Turing machine models? Design the Turing machine for  $L = \{a^m b^m c^m : m \geq 1\}$ .(b) Describe various recursive functions? Write the recursive functions for division operation and  $e^x$  operations. Also verify your results.(c) What do you mean by a Turing computable function? Design a TM for copying a string i.e.  $q_0 w_1 \dots q_n w w$ 13-05-19 12:10a b caaa b aa bbb 226

18 mca - 54  
Department of Computer Science, Jamia Millia Islamia, New Delhi-25

M.C.A., II Semester, First Sessional Test Examination, February 26, 2019

CSCC23: Data and File Structures

Time: 45 Minutes

Max. Marks: 15

Instructions: Attempt all Questions. Answer in brief and avoid unnecessary details.

Ques. No. 1. Suppose that the numbers of the below series are stored in an Array object 'a'. Write (8)  
algorithms (that takes minimum number of movement operations) to delete duplicate  
numbers from 'a' one by one using its *del(index)* function and also derive the  
formula to get total number of movement operations.  
1, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, ..., n, n, n, n, ...,  $n^2$  times.

Ques. No. 2. Show that product of a lower triangular matrix and a diagonal matrix of same orders (7)  
is a lower triangular matrix. Let A be a lower triangular matrix and B is an upper  
triangular matrix of order  $n \times n$ . Write efficient algorithm to get product of A and B  
i.e.  $A \times B$ . Also derive the formula to get total number of multiplication operations in  
this algorithm.



MCA (SEM-II) EXAMINATIONS, 2019  
CBSE22: OOP in C++ Lab

SET-B

18H(A057

08-05-19

Time: 2 Hours

Attempt the following questions:

1. Class Distance consists of length in feet and inches. Class Distance contains
  - i. one default constructor
  - ii. one parameterized constructor
  - iii. function getdata() to take the value of feet and inches.
  - iv. function show() to display.
  - v. function to overload < operator to compare two distances
2. Write a program to create a class shape with functions to find area of and display the name of the shape and other essential component of the class. Create derived classes circle, rectangle and trapezoid each having overridden functions area and display. Write a suitable program to illustrate virtual functions.



MCA (SEM-II) EXAMINATIONS, 2019  
CBSE22: OOP in C++ Lab

SET-C

020519  
18meA054  
want shift Time: 2 Hours

Attempt the following questions:

1. Class student contains roll number, name and course as data member and input\_student and display\_student as member function. A derived class exam is created from the class student with publicly inherited. The derived class contains mark1, mark2, mark3 as marks of three subjects and input\_marks and display\_result as member function. Create an array of object of the exam class and display the result of 5 students.
2. Write a program with Student as abstract class and create derive classes Engineering, Medicine and Science from base class Student. Create the objects of the derived classes and process them and access them using array of pointer of type base class Student.



DEPARTMENT OF COMPUTER SCIENCE  
CBCS 21 Lab – Operating System and Shell Programming, MCA-II SEM

Roll No. ....50.....

04-05-19

SET A

grep -v

NOTE: ATTEMPT ANY FIVE QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.

Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.

Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.

Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.

Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or making files. Once the user has made a choice, have the program ask the user for the necessary information, such as file name, new name and so on.



010-05-19

Code: CSOC24

Roll No. 18meA 054

**MCA (SEM-II) PRACTICAL EXAMINATIONS - 2019**  
Microprocessor and Computer Architecture

Time: 2 Hours

Max Marks: 10

Write your Roll No. on the top immediately on receipt of the question paper

Set-C

1. Write and run (using appropriate calling program) a near procedure in assembly language that converts a packed 2 digit BCD number stored in AL register to equivalent Binary number. For example, if AL contains a packed BCD number 64 as 0110 0100, then the program will convert this BCD to equivalent binary number 01000000. The binary number should be returned back in the AL register itself.

2. Write an ALP which will find number of times letter 'a/A' exist in a given string AmehasdAA.

65 A  
97 a

60  
97

Handwritten signature