# General Programs

1. You have two large numbers stored as strings. Make a function to add them.
   1. Tell complexity of what you have made
2. Make a class Person with these attributes <name, status, num1, num2, id>
   1. I made a parameter wala constructor in it. He asked me if there is any default constructor. If yes, what does it do? And as you’re defining a new constructor with parameters here, will that work anymore?
   2. What are access specifier of constructor, functions, and data by default?
      1. He khud hi told me k constructor is public, rest of the two are private by default cuz I gave wrong answer.
3. Make your own split function that splits a string by a character
4. You have person data in a file separated by commas. Make a function that parses that data and returns a new Person’s object.

I made function declaration: Person\* parseData(String str);

* Why Person\*?
  + If you wont write \*, pointer will become dangling as you are doing new inside function.
* What is dangling pointer?
* Now bring a condition that brings dangling pointer case
  + Person person;

return &person;

(Person person; return person; and removing \* in declaration will not bring dangling pointer case as returning data will be copied to the calling function)

* If you don’t want to use \*, and you don’t want to do value-type... what is the next option that you can have?
  + Use & (reference operator)

# OOP

* What was there before OOP, and what was the problem that made us shift to OOP?

Procedural programming!

Problems:

* Global variables (can be accessible and editable everywhere)
* We think in objects, but program had no functions and data associated to single object instances.

#define<Animal.h> 🡪 it has int legs variable associated with the header file only

#define<Cat.h>

#define<Dog.h>

Now when you write main and include Cat.h and Dog.h. The variable legs will not be associated with single cat or dog instance. It will be general.

* 4 pillars of OOP
  + Encapsulation
  + Abstraction
  + Inheritance
  + Polymorphism
    - Types: Overloading, Overriding, Templating, Base ka pointer maintain krke derived class ka object usko assign krna
* What is encapsulation?
  + I told them whatever is contained inside class is said to be encapsulated inside it.
* What else is associated with encapsulation?
  + Access specifiers
* Name access specifiers and what are they?
  + Private
  + Public
  + Protected
* Is there any other access specifier you know about?
  + Yes. Sealed in C#. Don’t remember what it is
* What is overloading
  + Same function names, but different number of parameters or different types of parameters
* Int add(int a, int b);

Float add(int a, int b);

Int main()

{

Int x = add(4,5);

Float y = add(4,5);

}

* Is this overriding?
* No. it wont work. Compilation error.
* What error?
  + - I said function redefinition may be. he said no, it is ambiguous function declaration
* Why no compile? Problem? Tell in terms of function pointers in memory.
  + - When reading add(4,5), it does not read ksme value return krni. Both functions k separate offsets honge in memory. Compiler will be confused donu ko 2 int chahiye the or naam add hai to ab Instruction pointer kahan le jaun.
* What is overriding
* What are function pointers
* Difference between struct and class
  + Ok… it is not that you cannot define functions inside structs. You can. **SEE HOW?**
* Class A {

A() { cout << ‘a’; }

Do() { cout << ‘a’; }

}

Class B : A {

B() { cout << ‘b’; }

Do() { cout << ‘b’; }

}

Class C : A {

C() { cout << ‘c’; }

Do() { cout << ‘a’; }

}

Outputs after each line:

1. A\* a = new A();
2. B\* b = new B();
3. C\* c = new C();
4. A\* d = new B();
5. A\* e = new C();
6. a->Do();
7. b->Do();
8. c->Do();
9. d->Do();
10. e->Do();
    * 2 me srf B ka ctr call nhi hoga. A ka bhi hoga cuz B needs A to be fully made. So, wo pehle call hoga ya baad me?
    * 7th ka I said a will be printed. He asked why? I said because that variable has static binding with class A.
    * He said what if we want to call b’s function? I said we’ll write virtual keyword with class A ka function
    * He wrote virtual with class A’s function. And asked, now 8th ka output kia hoga?
    * I said b again. Cuz b k sath virtual nhi lga hua. Jahan se virtual ki base🡪derived chain break hogi (static binding ajaegi), wahan dynamic binding wale object pr move nhi kr paega and it will stop and print there.

* What are virtual constructors
* What are virtual destructors
* Destructors kyun call krte? Ek object khud ko to destroy kr nhi skta, OS will obviously do it. Then why do we write destructor for?
  + Koi explicitly class me new kari ho cheez uski memory explicitly free krne k liye

# Data Structures

* Complexities btao… both best and worst case
  + Bubble sort
  + Selection sort
  + Insertion sort
* AVL Tree khod diya pura
  + What is it
  + What is balanced tree? What is the condition that tells whether a node is balanced or not?
  + Made a tree and asked if it is balanced. It was balanced.
  + Inserted another node in right of right subtree. Asked me how to balance it
    - By single rotation left
  + Why is it used? I said for efficient searching may be. Cuz its search complexity is O(log2n)
  + How do you get this number Log2n?
    - At each level, there are 2level nodes. 2level = n 🡪 level = log2n
* Oh, so you do it with formulae? Tell me about this function that you have made. Showed me split function n asked me what will be its complexity.
  + It was O(n)
* So what determines complexity?
  + I told them number of memory accesses. They said yeah. But with space complexity, it is also time complexity (number of CPU cycles the operations take).
* Hashmap bhi khod dia
  + What does it require?
    - A hash function, and an array!
  + When is it used?
    - Efficient searching needed. Unique keys present
  + How to insert element in it? If there are collisions, what techniques are used to resolve collisions?
  + How to search in this table? Search complexity?
* Array or linked list me farq
* Doubly linked list and tree me farq
* How would you choose between data structures?
* If you have that same person class with unique keys and you have 5 million records in the file, what data structure would you use and why?
  + I galati se said Tree. He said there is no hierarchy of those persons, whereas in tree you need hierarchy.
  + I said hashtable then. Correct one!

# OS

* What is thread
* Difference between thread and process
* Why synchronization?
* What are different synchronization techniques used?
* Difference between deadlock and locks
* What is deadlock
* Deadlock prevention techniques?
  + I didn’t know of any. He told me banker’s algorithm
* How to prevent deadlocks if they have already occurred?
* If I have a single CPU, is it good to have multithreading in it?
  + I told them multithreading is good. Cuz if a thread is waiting for I/O, it must not stop other threads to make use of CPU.
* What if this is the case? Array = {0,1,2,3,4,5} suppose t1 adds 0,1; t2 adds 2,3; t3 adds 4,5. Here tasks are CPU intensive, no one is waiting for I/O. Is it still good to have multithreading?
  + I said no. Context switching also takes sufficient time so it is better not to have multithreading here as tasks are too small too.
  + However, if tasks are big and CPU intensive, we can use multithreading to give illusion to users that all are working simultaneously.
* What is context switching?
* Does context switching occur in process only? Or in threads too?
* How many registers are there in CPU?
* Physically, in memory, how is context switching done?
* How is a process stored in memory?
  + Stack upar se aega, heap niche se
  + Uske niche global variables
  + Uske niche program code segment that has all functions. Function pointers are pointing here.
* What are virtual tables esa kuch pucha tha… didn’t remember

# DB

* What is normalization?
* When is normalization done? After what step of DB Design?
* Tell me at least one case where you do not need normalization?
  + FB comments
  + History data
* What is denormalization?
* What is ACID property?
* If you have a huge table, a very huge one… how to make search efficient in it? Esa kuch sawal tha. I remember kuch alag si cheez use hoti isme... but couldn’t remember
* Salary is attribute in employee’s table. Find the third maximum salary?

# IQ

* 2 Sandglasses hain. One measures 7min. One measures 4min. Measure 9min!