Week 04

- Copy Constructor
- Shallow vs Deep Copy
- Private Functions
- Constant Data & Functions

Shallow Vs Deep Copy

first and second after the statement second = first; executes

first and second both pointing to their own data

Copy Constructor

Copy Constructor

- Copy constructor are used when:
  - Initializing an object at the time of creation
  - When an object is passed by value to a function

Example

```
void func1(Student student){
…
}
int main(){
  Student studentA(“Ahmad”);
  Student studentB = studentA;
  func1(studentA);
}
```

Copy Constructor (contd.)

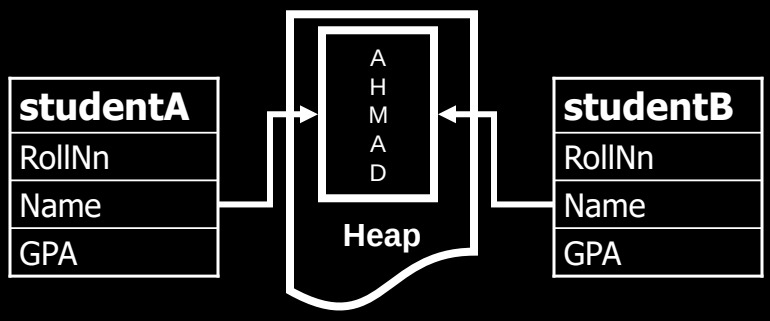
```
//compiler generated copy
  constructor
Student::Student(
    const Student &obj){
  rollNo = obj.rollNo;
  name = obj.name;
  GPA = obj.GPA;
}
//member-wise copy
```

Shallow Copy

- When we initialize one object with another then the compiler copies state of one object to the other
- This kind of copying is called shallow copying

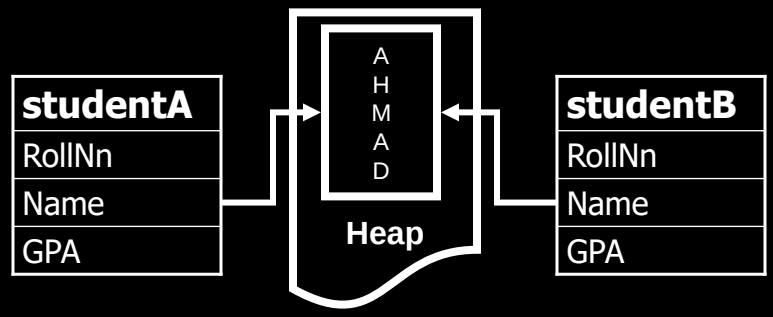
Example

```
Student studentA("Ahmad");
Student studentB = studentA;
```



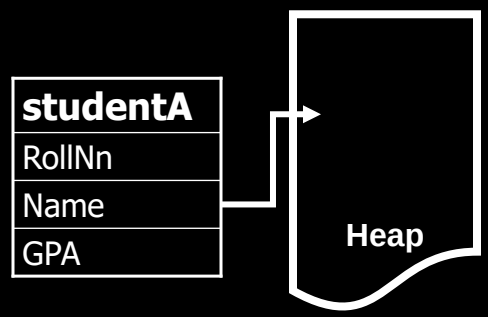
Example

```
int main(){
 Student studentA("Ahmad",1);
 {
  Student studentB = studentA;
```



Example

```
int main(){
 Student studentA("Ahmad",1);
 {
  Student studentB = studentA;
 }
}
```

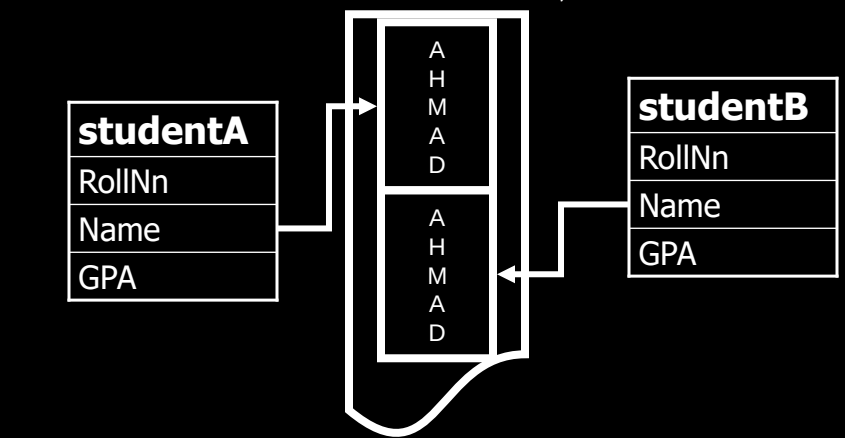


Copy Constructor (contd.)

```
//user defined copy constructor
Student::Student(
          const Student &   obj){
  int len = strlen(obj.name);
  name = new char[len+1]
  strcpy(name, obj.name); //deep copy
  …
  /*copy rest of the data members*/
}
```

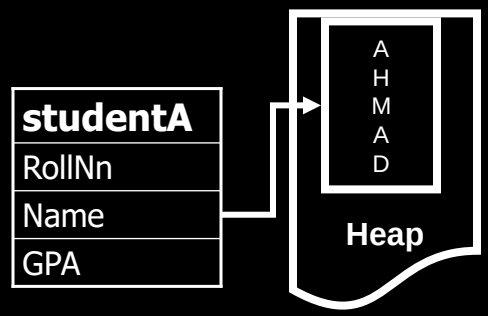
Example

```
int main(){
 Student studentA("Ahmad",1);
 {
  Student studentB = studentA;
```



Example

```
int main(){
 Student studentA("Ahmad",1);
 {
  Student studentB = studentA;
 }
}
```



Copy Constructor (contd.)

- Copy constructor is normally used to perform deep copy
- If we do not make a copy constructor then the compiler performs shallow copy

Destructor

- Destructor is used to free memory that is allocated through dynamic allocation
- Destructor is used to perform house keeping operations

Destructor (contd.)

- Destructor is a function with the same name as that of class, but preceded with a tilde '~'

Example

```
class Student
{
  …
public:
  ~Student(){
     if(name){
         delete []name;
     }
  }
}
```

Overloading

- Destructors cannot be overloaded

Sequence of Calls

- Constructors and destructors are called automatically
- Constructors are called in the sequence in which object is declared
- Destructors are called in reverse order

Example

```
Student::Student(char * aName){
  …
     cout << aName << "Cons\n";
  }
  Student::~Student(){
     cout << name << "Dest\n";
  }
};
```

Example

```
int main()
{
  Student studentB("Ali");
  Student studentA("Ahmad");
  return 0;
}
```

Example

Output:

Ali Cons

Ahmad Cons

Ahmad Dest

Ali Dest