

Assignment - 18

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Explain the difference between static memory Allocation and dynamic memory allocation

→ static memory Allocation

1) memory is Allocated at compile time

→ There is no specific function in static memory Allocation

3) store in stack

4) Size must be known at compile time

5) once the memory is allocated, the memory size can not be changed

Dynamic memory Allocation

1) memory is Allocated at run time

→ new function is used in dynamic memory Allocation

3) store in heap section.

4) Size may be unknown at compile time

5) when memory is allocated the memory size can be changed

(Q2) what are the advantages & disadvantages of dynamic memory allocation over static memory allocation

→ Advantages:

- 1) Flexibility: can allocate memory as needed during program execution as compare to static memory allocation has limited flexibility
- 2) Efficiency for variable data sizes optimizes memory usage by only allocating the necessary amount of memory for a given task compare to static is having inefficient for variable data sizes.
- 3) Suitable for complex programs can handle situation where data size is unknown or changes frequently

Disadvantages:

- 1) Slower execution:
require extra overhead to manage memory allocation & deallocation at runtime compare to static memory allocation has fast execution.

- 2) memory leaks potential
If not managed carefully, forgetting to deallocate unused memory can lead to memory leaks
- 3) Increased complexity
Requires explicit memory management by the programmer.
- 4) List down the function and its syntax which are used in programming for dynamic memory allocation

→ malloc()

- malloc stands for memory allocation
- Allocates a single block of memory of specified size in bytes.

Syntax: void *ptr = malloc(size);

2) calloc()

- calloc stands for calculation
- in case of calloc we have to pass 2 parameters
- first parameter is no-of-elements
- & second is size-of-each element

Syntax:-

void * ptr = malloc (no, size);

3) realloc ()

- this func() is used to Allocate the
resize the Allocated memory size.

* realloc is used to increase or
decrease the size of already
allocated memory.

Syntax:-

void * ptr = realloc (ptr, new_size);

Q4) which function / operators are used
in C++ programming for dynamic
memory allocation & deallocation.

→ for memory Allocation in C++
use the new operator.

- the new internally contain (alloc)
malloc() functions.

- for the memory Deallocation in
C++ we use delete operator.

(5) write down the difference between malloc() and calloc()

→ malloc()

i) malloc() allocates a single block of uninitialized memory

ii) malloc() stands for memory allocation

iii) malloc() takes one argument

iv) Syntax:

`void *ptr = malloc(size);`

calloc()

i) calloc() allocates multiple blocks of zero-initialized memory

ii) calloc() stands for calculation

iii) calloc() takes 2 arguments

iv) Syntax:

`void *ptr = calloc(no, size);`

(6) Explain the prototype of malloc() function with example

→ The prototype of malloc function is

`void *malloc (size);`

it takes a single parameter i.e size, which represents the number of bytes of memory to allocate. & return. void.

void pointer ('void *') to the beginning of the allocated memory block.
if memory allocation fails it returns NULL.

e7] Why return value of malloc(), calloc() and realloc() is void?

→ The return value of malloc(), calloc() and realloc() is void* because they are designed to allocate generic memory blocks meaning they don't know what specific data type will be stored in the allocated memory. therefore, the pointer returned can be cast to any data type needed by the programmer making it a generic pointer represented by void*.

e8] What are the different uses of realloc()

→ realloc() is used to increase or decrease the size of already allocated memory.

it is used to change the size of an array that was previously allocated on the heap

- realloc() can be used to create dynamic data structures like linked list and trees.

Q9) what will happen if we use first parameter of realloc() as NULL

- If the ptr is NULL, realloc() reserves a block of storage of size bytes
- it does not give all bits of each element an initial value of 0
- it is considered as failure.

Q10) what will happen if second parameter of realloc() is 0?

- If size is 0, the realloc() function returns NULL. If there is not enough storage to expand the block to the given size the original block is unchanged and the realloc() function returns NULL.