```
}; union z z1;

z1.b1.j=20;

z1.a1.i=10;

z1.a1.ch[10]= " i";

z1.b1.d[0]="j ";

printf(" ");
```

Dynamic memory Allocation

The process of allocating memory at the time of execution or at the runtime, is called dynamic memory location.

Two types of problem may occur in static memory allocation.

If number of values to be stored is less than the size of memory, there would be wastage of memory.

If we would want to store more values by increase in size during the execution on assigned size then it fails.

Allocation and release of memory space can be done with the help of some library function called dynamic memory allocation function. These library function are called as **dynamic memory allocation function.** These library function prototype are found in the header file, "alloc.h" where it has defined.

Function take memory from memory area is called heap and release when not required.

Pointer has important role in the dynamic memory allocation to allocate memory.

malloc():

This function use to allocate memory during run time, its declaration is void*malloc(size);

malloc ()

returns the pointer to the 1st byte and allocate memory, and its return type is void, which can be type cast such as:

int *p=(datatype*)malloc(size)

If memory location is successful, it returns the address of the memory chunk that was allocated and it returns null on unsuccessful and from the above declaration a pointer of type**(datatype)** and size in byte.

And **datatype** pointer used to typecast the pointer returned by malloc and this typecasting is necessary since, malloc() by default returns a pointer to void.

Example int*p=(int*)malloc(10);

So, from the above pointer p, allocated IO contigious memory space address of 1st byte and is stored in the variable.

We can also use, the size of operator to specify the the size, such as *p=(int*)malloc(5*size of int) Here, 5 is the no. of data.

Moreover , it returns null, if no sufficient memory available , we should always check the malloc return such as, **if(p==null)**

printf("not sufficient memory");

Example:

/*calculate the average of mark*/

void main()

{

int n , avg,i,*p,sum=0;

```
printf("enter the no. of marks ”);
scanf(“%d”,&n);
p=(int *)malloc(n*size(int));
if(p==null)
printf(“not sufficient”);
exit();
}
for(i=0;i<n;i++)
scanf(“%d”,(p+i));
for(i=0;i<n;i++)
Printf(“%d”,*(p+i));
sum=sum+*p;
avg=sum/n;
printf(“avg=%d”,avg);
```

Lecture Note: 28

calloc()

Similar to malloc only difference is that calloc function use to allocate multiple block of memory .

two arguments are there

1st argument specify number of blocks

2nd argument specify size of each block.

Example:-

```
int *p= (int*) calloc(5, 2);
```

int*p=(int *)calloc(5, size of (int));

Another difference between malloc and calloc is by default memory allocated by malloc contains garbage value, where as memory allocated by calloc is initialised by zero(but this initialisation) is not reliable.

realloc()

The function realloc use to change the size of the memory block and it alter the size of the memory block without loosing the old data, it is called reallocation of memory.

It takes two argument such as;

int *ptr=(int *)malloc(size);

int*p=(int *)realloc(ptr, new size);

The new size allocated may be larger or smaller.

If new size is larger than the old size, then old data is not lost and newly allocated bytes are uninitialized. If old address is not sufficient then starting address contained in pointer may be changed and this reallocation function moves content of old block into the new block and data on the old block is not lost.

Example:

```
#include<stdio.h>

#include<alloc.h>

void main()

int i,*p;
```

```
p=(int*)malloc(5*size of (int));
if(p==null)
{
printf(“space not available”);
exit();
printf(“enter 5 integer”);
for(i=0;i<5;i++)
{
scanf(“%d”,(p+i));
int*ptr=(int*)realloc(9*size of (int) );
if(ptr==null)
{
printf(“not available”);
exit();
}
printf(“enter 4 more integer”);
for(i=5;i<9;i++)
scanf(“%d”,(p+i));
for(i=0;i<9;i++)
                    printf(“%d”,*(p+i));
}
```

free()

Function free() is used to release space allocated dynamically, the memory released by free() is made available to heap again. It can be used for further purpose.

Syntax for free declaration .

void(*ptr)

Or

free(p)

When program is terminated, memory released automatically by the operating system. Even we don't free the memory, it doesn't give error, thus lead to memory leak.

We can't free the memory, those didn't allocated.

Lecture Note: 29

Dynamic array

Array is the example where memory is organized in contiguous way, in the dynamic memory allocation function used such as malloc(), calloc(), realloc() always made up of contiguous way and as usual we can access the element in two ways as:

Subscript notation

Pointer notation

Example: