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CHAPTER-3
FUNCTIONS (INBUILT & USER DEFINED)

- o Types of functions
- o Types of library functions
  - **string functions**
    strcpy(), strncpy(), strcat(), strncat(), strchr(), strrchr(), strcmp(), strncmp(), strspn(), strcspn(), strlen(), strpbrk(), strstr(), strtok()
  - **Mathematical Functions**
    Acos(), asin(), atan(), ceil(), cos(), div(), exp(), fabs(), floor(), fmod(), log(), modf(), pow(), sin(), sqrt()
  - **Date and time functions**
    clock(), difftime(), mktime(), time(),asctime(),ctime(), gmtime(), localtime(), strftime()
  - **I/O Formatting Functions**
    printf(), scanf(), getc(), getchar(), gets(), putc(),putchar(), puts(),ungetc()
  - **Miscellaneous Functions**
    delay(), clrscr(), clearer(), errno(), isalnum(), isalpha(), iscntrl(), isdigit(), isgraph(), islower(), isprint(), isspace(), isupper(), isxdigit(), toupper(), tolower().
  - **Standard Library functions**
    abs(), atof(), atol(), exit(), free(), labs(), qsort(), rand(), strtoul(), srand()
  - **Memory Allocation functions**
    malloc(), realloc(), calloc()
- o Types of user defined functions
- o Pointers
- o Function call by value & Function call by reference
- o Recursion
- o Storage class & Passing and returning value

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Q-1 What is Function ? Explain types of functions.

Detail :-

- ❖ Function is self contained block that used to perform some specific task.
- ❖ C language support mainly two types of functions:
  - ✓ Built – in Functions(Library Functions)
  - ✓ User – defined Functions
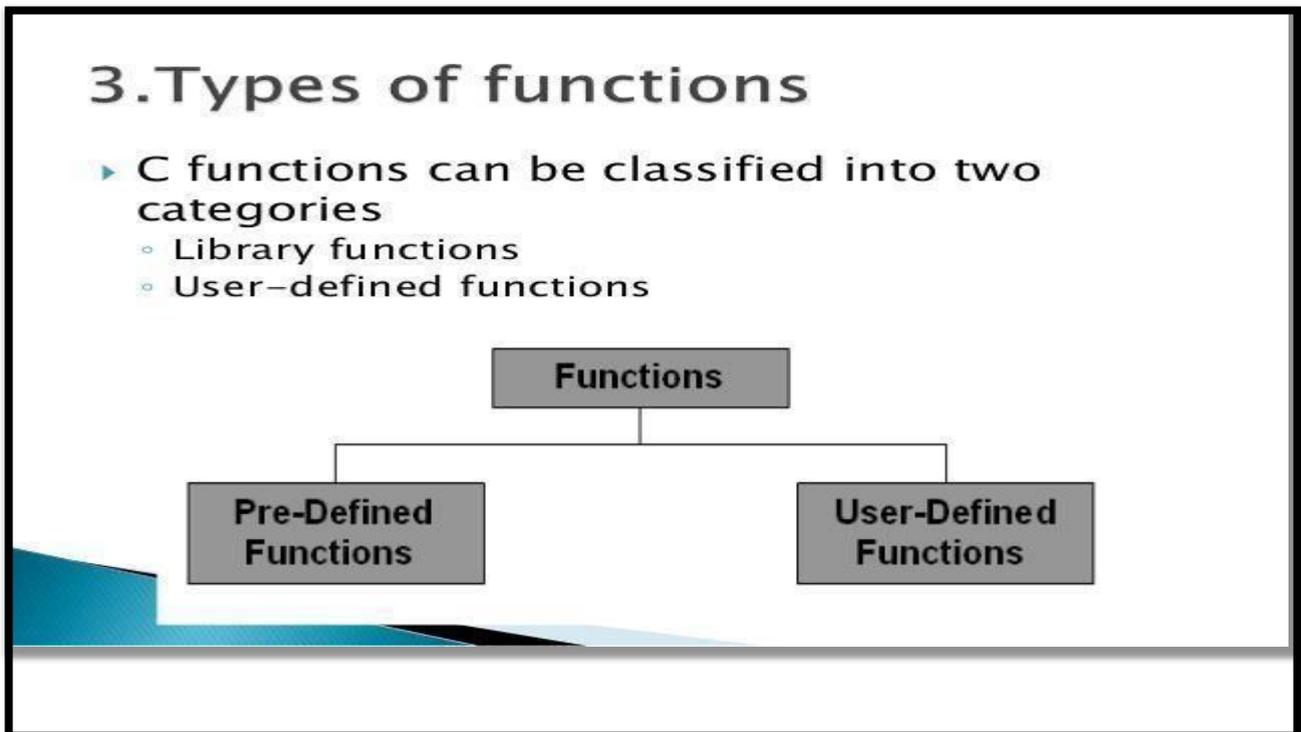
1 Word Question – Answer

SR.NO.	QUESTION	ANSWER
1	Function means_____	Self contained block that used to perform specific task.
2	How many types of functions supported by C?	Built-in(library) User defined

Q-3 List out and Explain different Types of Library functions:

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✓ **String Functions:**

✓ **STRING FUNCTIONS :-**

Detail :-

1. **Strlen() :-**
   • This functions is used to return length of any given string.
   • Length of the string is decide by terminating NULL Character('\0').

   Syntax :- Strlen (<string>)
   Example :- Char str [10] = "hello hi";
   Clrscr();
   Printf("%d",strlen(str));

2. **Strcpy() :-**
   • This function is used to copy the content of one string into another string.

   Syntax :- Strcpy (<destination str> , <source str>)
   Example :- Char str [ ] = "hello friends";
   Char str2[40];

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Clrscr();
Strcpy(str2,str1)
; Printf("%s",
str2);

3. **Strcpy() :-**
   • This function is used to copy first n character of given string intoanother string.
   Syntax :- Strcpy (<destination str> , <source str>,<size upto N>)
   Example :- Char str [ ] = "hello friends";
   Char str2[40];
   Clrscr();
   Strncpy(str2,str1,5);
   Printf("%s", str2);

4. **Strchr() :-**
   • This function is used to search first occurrence of specified character in given string and return rest of the string.
   Syntax :- Strchr (<string>,<Character to be search>)
   Example :- Char str [30] = "hello friends";
   Clrscr();
   Printf("%s", strchr(str,'f');

5. **Strrchr() :-**
   • This function is used to search last occurrence of specified character in given string and return rest of the string.
   Syntax :- Strrchr (<string>,<Character to be search>)
   Example :- Char str1 [30] = "This is just a string";
   Clrscr();
   Printf("%s", strrchr(str1,'s');

6. **Strcmp() :-**
   • This function is used to compare two strings character by character using ASCII value and return integer value.

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- If First string is greater than (>) the second string than it will return positive value.
- If first string is less than(<) the second strint than it will return negative value.
- If both strings are equal than it will return zero (0).

> **Syntax :- Strcmp (<str 1>,<str 2>)**
> **Example :- Char str1 [20] = "ABC";**
>   **Char str2[20] = "abc";**
>   **int c;**
>   **Clrscr();**
>   **C=strcmp(str1,str2);**
>   **Printf("%d",c);**

7. **Strncmp() :-**

   - This function is used to compare number character of string one into number character of string two.
   - This function start comparing first character of each string.
     Syntax :- int Strncmp (<str 1>,<str 2>,<size upto n>)
     Example :- Char str1 [20] = "R2A6a";
        Char str2[20] = "R2A5a";
       int r;
       Clrscr();
       r = strncmp(str1,str2,4)
       Printf("%d",r);

8. **Strcat() :-**
   - This function is used to append (join) one string with another string.
   - The character of second string will be appended to the first string.
     Syntax :- strcat (<str 1>,<str 2>)
     Example :-
        Char str1 [20] = "str";

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Char str2[20] = "cat";
Clrscr();
Printf("%s",strcat(a,b));

9. **Strncat() :-**

- This function is used to append (join) specified given number ofcharacters of destination string to source string.

Syntax :- strncat (<destination string>,<source string>,<upto N>)

Example :- Char str1 [20] = "to be";
Char str2[20] = "or not to be";
Clrscr();
Printf("%s",strncat(str1,str2,6));

10. **Strncat() :-**

- This function is used to append (join) specified given number ofcharacters of destination string to source string.

Syntax :- strncat (<destination string>,<source string>,<upto N>)

Example :- Char str1 [20] = "to be";
Char str2[20] = "or not to be";Clrscr();
Printf("%s",strncat(str1,str))

11. **Strspn() :-**

- This function is used to get length of substring of string 1 that ismade up of only those characters contained in string 2.

Syntax :- strspn (<string 1> , <string 2>)
Example :- Char str1 [20] = "I am 123";

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    Char str2[20] = "I am sorry123";
    int i;
    Clrscr();
   i=strspn(str1,str2);
    Printf("length of matched character is =%d", i);

12. Strcspn() :-

- This function is used to scan the main string for the given stringand return number of characters from beginning till the first matched character is found.

    Syntax :- strcspn (<string > , <string to be search>)

    Example :- Char str1 [20] = "ABCDEFG0123";
       Char str2[20] = "0123";
       int i;
       Clrscr();
       i=strcspn(str1,str2);
       Printf("First Matched character is at =%d", i);

13. Strstr() :-

- This function is used to find out first occurrence of substring str 2 instr 1 and returns remaining string.

    Syntax :- strstr (<str 1> , <str 2>)
    Example :- Char str1 [20] = "hi how r u";
       Char str2[20] = "how";
        Clrscr();
       Printf("substring is = %s",strstr(str1 ,str2));

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14. **Strtok() :-**

- This function is used to break the string into series of tokens using given delimeter.

   Syntax :- strtok (<str 1> , <delimeter>)

   Example :- Char str1 [20] = "www.hns.com";

   Char str2[20] = "."; Clrscr();

   Char *t;

   T = strtok(str1,str2);

   While (t!=NULL)

   {

   Printf("%s\n",t);

   T = strtok(str1,str2);

   }

15. **Strpbrk() :-**

- This function is used to find out first character in first string that match any character in second string.

   Syntax :- strpbrk (<str 1> , <delimeter>)

   Example :- Char str1 [20] = " I love kite";

   Char str2[20] = "kite";

   Char *t;

   T = strpbrk(str1,str2);

   If(t!=NULL)

   {

   Printf("matched character is =%c\n",*t);Else

   Printf("character not found");

   }

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1 Word Question – Answer

1	Which function is used to concatenate two or more strings?	Strcat()
2	Which function is used to return length of any given string?	Strlen()
3	Which function is used to copy one string into	Strcpy()

✓ **MATHS FUNCTIONS:**

Header File: :- **<math.h>**

✓ **MATHS FUNCTIONS :-**

Detail :-

1. **abs() :-**

   • This functions is used to return absolute value of any given number.
     Syntax :- abs (<number>)
     Example :- abs (-90)

2. **sqrt() :-**

   • This functions is used to return square root of any given number.
     Syntax :- sqrt (<number>)
     Example :- sqrt (100)

3. **ceil() :-**

   • This functions is used to return or round up given value upto near by maximum value of given number.
     Syntax :- ceil (<number>)

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Example :- ceil(-14.55)

4. floor() :-
- This functions is used to return or round up given value upto near by minimum value fo given number.
  Syntax :- floor (<number>)
  Example :- floor(-14.55)

5. div() :-
- This functions is used to return reminder of any given number.
  Syntax :- div (<number>,<divisible by>)
  Example :- div(10,3)

6. exp() :-
- This functions is used to return exponent value of any given number in which e raised to value of n.
  Syntax :- exp (<number>)
  Example :- exp(5)

7. pow() :-
- This functions is used to return the value calculated by given number and its power.
  Syntax :- pow (<number>,<raised to>)
  Example :- pow(2,3)

8. log() :-
- This functions is used to return natural logarithm of any given number.
  Syntax :- log(<number>)
  Example :- log(3.123)

9. modf() :-
- This functions is used to return integer part and floating point part

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of any given number.

Syntax :- modf(<number>,<int.part>)
Example :- modf(3.00000,3)

10. fabs() :-

- This functions is used to return absolute value of floating point number.
  Syntax :- fabs(<number>)
  Example :- fabs(-23.40)

11. sin() :-

- This functions is used to calculate sine value of given number.
  Syntax :- sin(<number>)
  Example :- result = sine(param number * pi)/180;

12. cos() :-

- This functions is used to calculate cosine value of any given number.
- It return the value in the range from -1 to +1;
  Syntax :- cos(<number>)
  Example :- result = cos(number * pi)/180;

13. asin() :- [arc = curve]

- Asin() is known as arc sin function.
- It used to calculate value of arc sine in the range from -1 to +1.
  Syntax :- asin(<number>)
  Example :- result = asin(number)*180.0/PI;

14. acos() :-

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- This function is used to calculate principle value of any number inthe range from 0 to 3.14

  Syntax :- acos(<number>)
  Example :- acos(number)*180.0/1;

15. atan() :-
- This function is known as arc tangent function.
- It is used to calculate principal value of any given number in the range [-n/2 , +n/2].
  Syntax :- atan(<number>)
  Example :- acos(number)*180.0/1;

16. fmod() :
- This function is used to calculate floating point reminder.
- You can calculate value like , x/y and it give you reminder.
  Syntax :- fmod(<number>,<divisible by>)
  Example :- fmod(5.3,2);

1 Word Question – Answer

1	Which function is used to round up the value upto nearest maximum integer value?	Ceil()
2	Which function is used to return reminder of any given value?	Div()
3	Which function is used to return absolutevalue of any given value?	Abs()
4	Which function is used to return square root of any given value?	Sqrt()
5	Which header file must be include to perform maths functions?	<math.h>

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✓ **DATE & TIME FUNCTIONS :-**

<time.h>	
clock_t clock()	Returns clock ticks since program starts.
char *asctime(stuct tm)	Converts date and time into ascii.
int stime(time_t *tp)	Sets time.
time_t time(time_t *timer)	Gets time of day.
double difftime(t1,t2)	Returns difference time between two times t1 and t2.

Header File: <time.h>
Detail :-

1. clock():

- clock() determines the amount of processor time used since the invocation of the calling process, measured in clocks_per_sec of a second.

Syntax:

clock_t clock(void);

2. mktime():

- mktime() transforms binary date and time values.

Syntax:

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time_t mktime (struct tm *timeptr);

3. time():

- time() is used to get current system time.

Syntax:

time();

4. difftime():

- difftime() is used to get difference between two given times.

Syntax:

Difftime(endtime , starttime)

5. ctime():

- ctime() converts the time_t object pointed by timer to a C string containing human-readable version of the corresponding local time and date.
- The returned string has following format:

Www Mmm dd hh:mm:ss yyyy

- Where Www is the weekday, Mmm the month in letters, dd the day of the month, hh:mm:ss the time, and yyyy the year.

Syntax:

char * ctime (const time_t * timer);

6. localtime():

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• localtime() converts time_t to tm as localtime.
• localtime() uses the time pointed by timer to fill a tm structure with the values that that represent thecorresponding local time.

Syntax:

struct tm * localtime (const time_t * timer);

7. **strftime():**

• strftime() format time to string. strftime() copies into a ptr the content of format, expanding its format tags into the corresponding values as specified by tiemptr, with a limit of maxsize characters.

Syntax:

size_t strftime (char * ptr, size_t maxsize, const char * format,const struct tm * timeptr);

1 Word Question – Answer

1	Which function is used to get current system time?	Time()
2	Which function is used to convert time object into string object?	Ctime()
3	Which function is used to get difference between two given times.	Difftime()
4	Which header file must be include to perform time functions?	\<Time.h>

✓ **I/O FORMATTING FUNCTIONS :-**

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Header File   :-   <stdio.h>
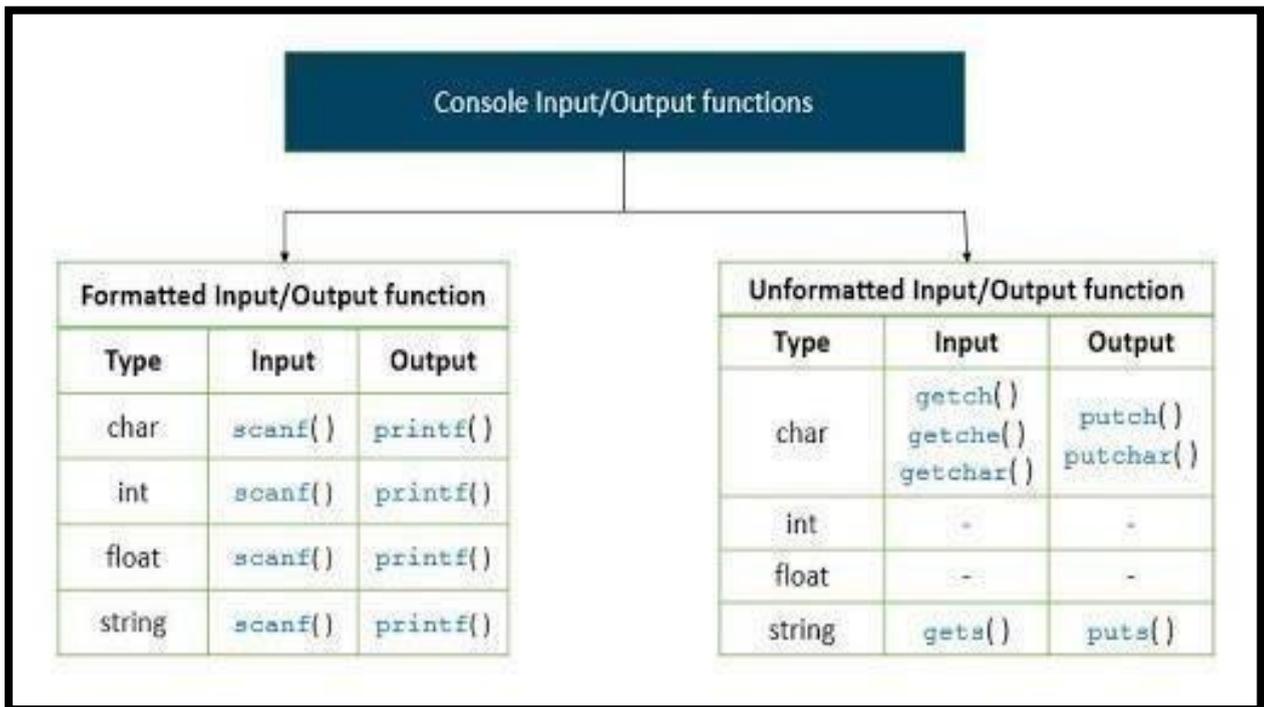
Detail :-

1. **printf():**

   - printf() is output function. printf() is used for printing formatted data to stdout. This function is generally used for printing text and numericvalues.

   Syntax:

   printf("control string",arg1,arg2…..);

   - In the above syntax, control string indicates how many arguments are there and what their types are. The control string consists of three types:

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- Characters to be printed on screen.
- Format specifiers.
- Escape sequence characters. (\n, \t)

2. scanf():

- scanf() is an input function. It is used to read the data entered by theuser. scanf() scans the formatted values.

Syntax:

scanf("control string",&arg1, &arg2……);

- In the above syntax, control string specifies the field format in which the data is to be entered.The arguments &arg1, &arg2…….specifiesthe address of the locations where the data is stored.

- scanf() is also required to read multiple values using the same scanf function. The control string consists of three types:
  - Characters to be printed on screen.
  - Format specifiers.
  - Escape sequence characters. (\n, \t)

3. getc():

- This function is used to get a single character from input stream.

Syntax:

Getc (<input stream>)

Example:

Ch = getc(stdin);

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4. putc():

- This function is used to put/print a single character to outputstream.

Syntax:

> **putc (<character> , <output stream>)**

Example:

> **Ch = putc('a' , stdout);**

5. gets():

- This function is used to get or read particular string with white space character.

Syntax:

> **Gets(<string>)**

Example:

> **Gets("hello friends");**

6. puts():

- This function is used to put or print particular string with white space character.

Syntax:

> **puts(<string>**

Example:

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```
Void main()
{
        Char ch;
        Printf("enter character");
        Ch = getchar();
        Getch();
}
```

7. getchar():

- This function is used to get a single character from standard input.

Syntax:

```
<variable> = getchar();
```

Example:

```
Void main()
{
        Char ch;
        Printf("enter character");
        Ch = getchar();
        Getch();
}
```

8. putchar():

- This function is used to print a single character to standard output.

Syntax:

```
Putchar(<character variable>)
```

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Example:

```
Void main()
{
        Char ch;
        Printf("enter character");
        Ch = getchar();
        Putchar(ch);
        Getch();
}
```

1 Word Question – Answer

1	Which function is used to get or read particular string with white space character?	Gets()
2	Which function is used to print single character to the output stream?	Putc()
3	Which function is used to print formatted output ?	Printf()
4	Which function is used to read input from the userside?	Scanf()

5	Which function is used to read a single character from standard input?	Getchar()
6	Which header file must be include to perform all I/O formatting functions?	<stdio.h>

✓ **STANDARD LIBRARY FUNCTIONS :-**

Header File: :-   <stdio.h>

Detail :-

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1. **atol():**
   - This function is used to convert string argument to long integer value.

   Syntax:

   > atol(<string>)

   Example:

   ```
   Void main()
   {
        Char a[20] = "hi friends";
        long b;
        b= atol(a);
        printf("string=%s",longint = %ld",a,b);
        getch();
   }
   ```

2. **atof():**
   - This function is used to convert string argument to float number.

   Syntax:

   > atof(<string>)

   Example:

   ```
   Void main()
     {

        Char a[20] = "1234567";
        float b;
        clrscr();
        b= atof(a);
        printf("string=%s",float = %f",a,b);getch();
   }
   ```

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3. **exit():**

   • This function is used to terminate calling process immediately.

   Syntax:

   exit(<int>)

   Example:

   ```
   Void main()
   {
        Clrscr();
        Printf("starting of program\n");
        Exit(0);
        Printf("exiting of program\n");
        getch();
   }
   ```

4. **labs():**

   • This function is used to return absolute value of long integer value.

   Syntax:

   labs(<long integer>)

   Example:

   ```
   Void main()
   {
   ```

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```
        long int a,b;
        a=labs(65987);
        Printf("%ld\n",a);
        B=labs(-100509);
        Printf("%ld\n",b);
        getch();


}
```

5. rand():

• This function is used to generate random numbers in the range from 0 to n.

Syntax:

labs(<long integer>)

Example:

```
Void main()
{
    int   i,n;
    clrscr();
   printf("enter  n");
   scanf("%d",&n);
   for(i=1;i<=n;i++)
     {

            Printf("%d",rand()%50);
     }
Getch();
}
```

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1 Word Question – Answer

1	**Which function is used convert stringargument into long integer value?**	**Atol**()
2	Which function is used to terminate callingprocess immediately?	**Exit**()
3	Which function is used to generate randomnumbers in the range from 0 to n?	**Rand**()
4	**Which function is used to return absolutevalue of any long integer value?**	**labs**()

✓ **MISCELLANEOUS FUNCTIONS :-**
Header File::- **<stdio.h>**

Miscellaneous functions	Description
getenv()	This function gets the current value of the environment variable
setenv()	This function sets the value for environment variable
putenv()	This function modifies the value for environment variable
perror()	Displays most recent error that happened during library function call
rand()	Returns random integer number range from 0 to at least 32767
delay()	Suspends the execution of the program for particular time

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Function	Return Type	Use
isalnum(c)	int	Determine if the argument is alphanumeric or not
isalpha(c)	int	Determine if the argument is alphabetic or not
isascii(c)	int	Determine if the argument is ASCII character or not
isdigit(c)	int	Determine if the argument is a decimal digit or not.
toascii(c)	int	Convert value of argument to ASCII
tolower(c)	int	Convert character to lower case
toupper(c)	int	Convert letter to uppercase

Detail :-

1. **delay():<dos.h>**

- This function is used to suspend execution of program forparticular amount of time.

   Syntax:

   delay(<int>)

   Example:

   #include<dos.h>

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```
Void main()
{
        printf("This c program will exit in 10 seconds.\n");
        delay(10000);
        getch();
}
```

• Above c program exits in ten seconds, after the printf function is executed the program waits for 10000 milliseconds or 10 seconds and then program termination occurs.

2. clrscr():

- This function is used to clear the output of the screen.

Syntax:

```
Clrscr();
```

Example:

```
Void main()
{

Int i=10;
Clrscr();
printf("%d",i);

getch();
}
```

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3. islower():<ctype.h>

• This function is used to check if entered character is in lowercaseor not.

> **Syntax:**
>
> islower(character);
>
> **Example:**
> #include<ctype.h>
>
> Void main()
> {
>   Char ch = 'A';
>   Clrscr();
> If(islower(ch))
>   Printf("lowercase");
> Else
>   Printf("not in lowercase");
>
>   getch();
> }

4. isupper():<ctype.h>

• This function is used to check if entered character is in uppercase or not.

> **Syntax:**
>
> isupper(character);

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Example:
#include<ctype.h>

```
Void main()
{
        Char ch =
        'A'; Clrscr();
        If(isupper(ch))
                Printf("uppercase");
        Else
                Printf("not in uppercase");
        getch(); }
```

5. **isspace():<ctype.h>**

- This function is used to check if entered character is whitespace character or not.

Syntax:
    isspace(character);

Example:
#include<ctype.h>

```
Void main()
{
        Char ch = ' ';
        Clrscr();
        If(isspace(ch))
                Printf("whitespace ");
        Else
```

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Printf("not whitespace");

getch();
}

6. **isalpha():<ctype.h>**

   • This function is used to check if entered character is alphabet ornot.

   Syntax:

   Isalpha(character);

   Example:
   #include<ctype.h>

   Void main()
   {

   Clrscr();
   If(isalpha(ch))
   Printf("alphabet");
   Else
   Printf("not alphabet");

   Getch();

   }

7. **isprint():<ctype.h>**

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- This function is used to check if entered character is printable or not.

Syntax:

   Isalpha(character);

Example:

   #include<ctype.h>

   Void main()
   {

      Char ch = 1;
      Clrscr();
      If(isprint(ch))
            Printf("printable");
      Else
            Printf("not printable");

      getch();
   }

8. **isdigit():<ctype.h>**

   - This function is used to check if entered character is digit or not.

Syntax:

   Isdigit(character);

Example:

   #include<ctype.h>

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```
Void main()
{

    Char ch = 'a';
    Clrscr();
    If(isdigit(ch))
            Printf("digit");
    Else
            Printf("not digit");

getch(); }
```

9. isalnum():<ctype.h>

- This function is used to check if entered character is alphabet or number.

Syntax:

Isalnum(character);

Example:

```
#include<ctype.h>

Void main()
{
    Char ch = 'a';
    Clrscr();
    If(isalnum(ch))
            Printf("alpha-numeric");

    Else
```

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Printf("not alpha-numeric");

getch();
}

10. **isctrl():<ctype.h>**

- This function is used to check if entered character is control character or not.

Syntax:

Isdigit(character);

Example:
#include<ctype.h>

Void main()
{
Char ch = '%';
Clrscr();
If(isctrl (ch))
Printf("control character");
Else
Printf("not control character");

getch();
}

11. **errno():<ctype.h>**

- This function is used to return error number related to particular object.

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- **Note :-** you have to include header file **<errno.h>**

Syntax:

   errno( );

Example:
   #include<errno.h>

   Void main()
   {
         File *fp;
        Fp=fopen("hello.txt","r");
        Printf("errno=%d\n",errno());

        Getch();
   }

12. toupper():<ctype.h>

   - This function is   used to   convert lowercase character intouppercase.

Syntax:

   toupper(<character>)

Example:
 #include<errno.h>

   Void main()
   {

        Char ch= 'a';

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```
        Clrscr();
         Int c=toupper(ch);
        Printf("%c",c);
        getch();
    }
```

13. tolower():<ctype.h>

- This function is used to convert uppercase character   into lowercase.

Syntax:

tolower(<character>)

Example:
#include<errno.h>

```
Void main()
{
    Char ch= 'A';
    Clrscr();
     Int c=tolower(ch);
    Printf("%c",c);
    getch();
}
```

1 Word Question – Answer

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1	Which function is used convert lowercase character into uppercase?	Toupper()
2	Which function is used to check if entered character is digit or not ?	Isdigit()
3	Which function is used to check if entered character is white space character or not?	Isspace()
4	This function is used to suspend execution ofprogram for particular amount of time.	Delay()
5	Which function is used to clear the output screen()?	Clrscr()

✓ **MEMORY ALLOCATION FUNCTIONS :-**

Header File: :-   <stdio.h>

- In c language there are two types of memory allocation:
  - Static memory allocation -designtime
  - Dynamic memory allocation -runtime

1. malloc():

- This function is used to allocate single block of requested memory.
- It always return NULL if memory is not sufficient.
  - **Syntax:**

    Ptr = (cast_type) malloc(byte_size)
  - **Example:**
    Ptr = (int) malloc(100*sizeof(int))

2. calloc():

- This function is used to allocate multiple block of requested memory.

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- It always return 0(zero) if memory is not sufficient.
   Syntax:

   Ptr = (cast_type) calloc(number ,byte_size)

   Example:
   Ptr = (float) calloc(25,sizeof(float))

3. **realloc():**

- If memory is not sufficient for malloc & calloc at that time you can use realloc() to re – allocate the memory space.
- It always return 0(zero) if memory is not sufficient.
   Syntax:

   Ptr = realloc(ptr , newsize)

   Example:
   Ptr = realloc(p,n*sizeof(int))

4. **free():**

- The memory allocated by malloc and calloc will be released or free by calling free().
- It occupies memory until you exit your program

   Syntax:

   Free(<pointer variable>)

   Example:

   Void main()
   {

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```
     Char *str;
    Clrscr();
     Str = "tutorialpoint";

     Printf("string=%s,address=%u\n",str,str);
     Free(str);
     getch();
 }
```

1 Word Question – Answer

1	Which function is used allocate single block of requested memory?	Malloc()
2	Which function is used to allocate multipleblock of requested memory?	Calloc()
3	Which function is used to re-allocate the memory space?()	Realloc()
4	Which function is used to free the memory space allocated by malloc() and calloc()	Free()

Q-4 Explain UDF in detail.

Detail :-

- ❖ UDF stands for User Defined Function.
- ❖ UDF is a self contained block that perform some task.
- ❖ UDF Contains mainly following criteria:

    1. **Function Declaration (Function Prototype):**

        - The calling program should declare the function before it is used.
        - This is known as function declaration or function prototype.

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- A function declaration contains four elements
  - Function type

  - Function name
  - parameters list
  - terminating semicolon

Syntax:

function_type function_name(parameter list);

Example:

int add(int, int);

- Function declaration is similar to function header except the terminating semicolon.

✓ **Function Definition:**
- The function definition consists of the whole description and code of afunction.
- A function is called by simply writing the name of the function followed bythe argument list inside the parenthesis.

  Syntax:

  function_type function_name(parameter list)
  {
      local variable
      declaration;function
      statement 1;
      function statement 2;
      .
      .
      .

      return statement;

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}

Example :-

```
Int add(int x, int y)
{
        Int z;
         z = x + y;
        return(z);
}
```

✓ **Function call:**

- A function can be called by using the function name and list of actual parameters.

    Example
    :main()

    ```
    {
         c=add(10,5);//function call
        printf("%d",c);
    }
    ```
- In the above example, when a function calls statement encounter in program then the control is transferred to the function add().
- After this add function is executed line by line and the answer is return to the function call using the return statement.

Actual Parameters: The parameters which are used in functioncall is known as actual parameter. Actual parameters send the copy of the data of called function.

Formal Parameters: The parameters which are used in functiondefinition is known as formal parameters. Formal parameters will receive the data, sent by calling function.

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1 Word Question – Answer

1	UDF stands for_____	User defined function
2	Function declaration also called _____	Function prototype
3	The parameters which are used in function call is known as_____.	Actual parameters
4	The parameters which are used in function definition is known as_____.	Formal parameters

Q-4 Explain UDF with types.
Detail :

- UDF stands for User Defined Function.

- UDF is a self contained block that perform some task.

- UDF support mainly four types :
    - ✓ No argument No return
    - ✓ No argument with return
    - ✓ With argument no return
   - ✓ With argument with return

Functions

With Arguments
- declared and defined with parameter list
- values for parameter passed during call
- Eg :
  // declaration
  int sum (int x, int y);
  //call
  sum(10, 20);

Without Arguments
- No parameters included.
- No value passed during function call
- Eg :
  // declaration
  int display();
  // call
  display();

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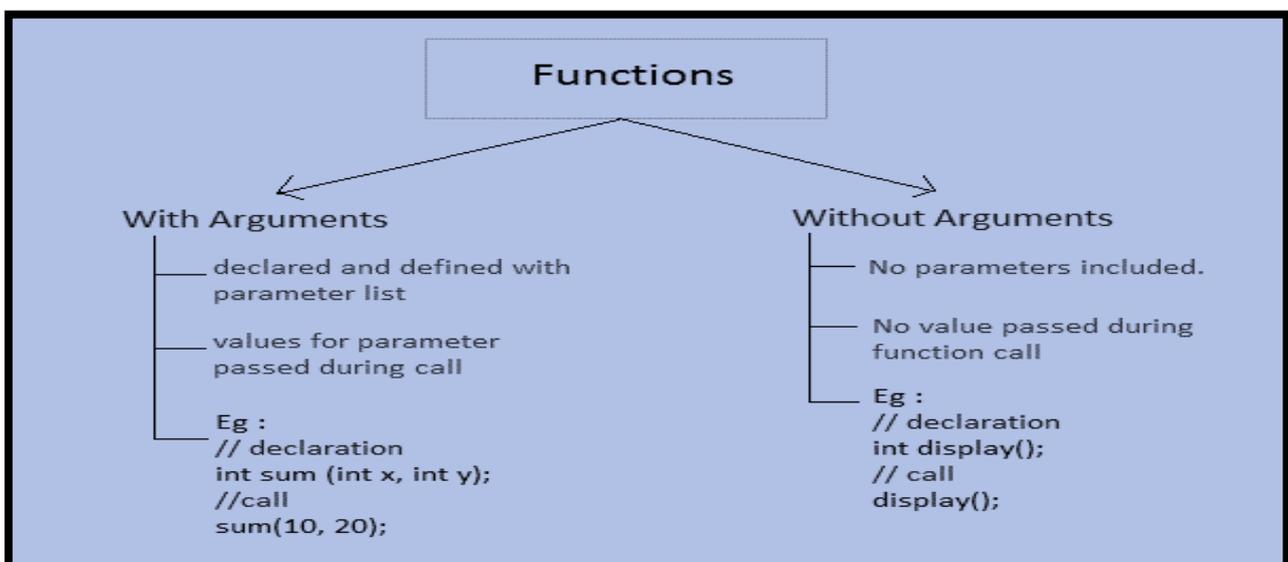
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✓ **No argument No return:-**
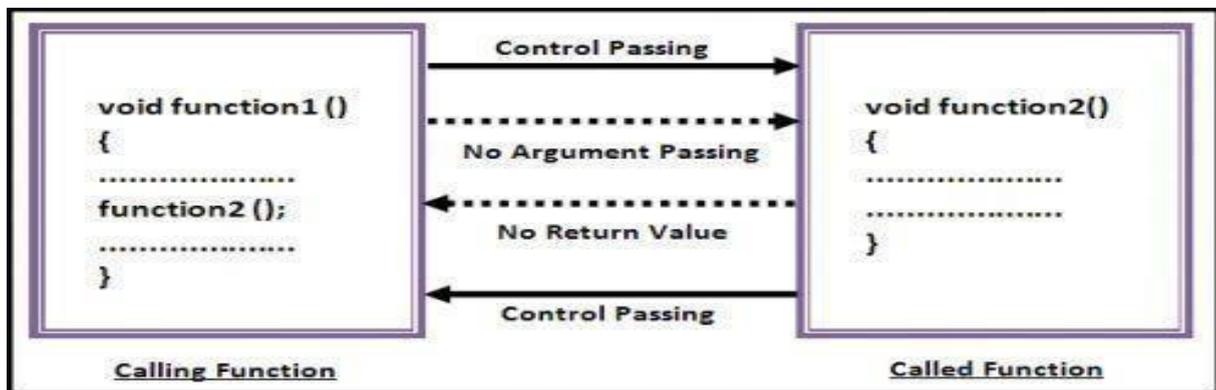
- This type of function does not receive any value and does not return any value.

Example :-

```
Void sk();    //function prototype
Void main()
{
      Sk(); //function calling
      getch();
}
Void sk()  //function definition
{
      Printf("hello");
}
```

✓ **No argument with return:-**

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- This type of function does not receive any value but return some value.

Example :-
int sk();   **//function prototype**
Void main()
{
      Int c;
      c = sk();   **//function calling**
      Printf("%d",
    c);

      getch();
}
int sk() **//function definition**
{
      Int i=10;
     Return
     (i);
}

✓   **with argument no return:-**

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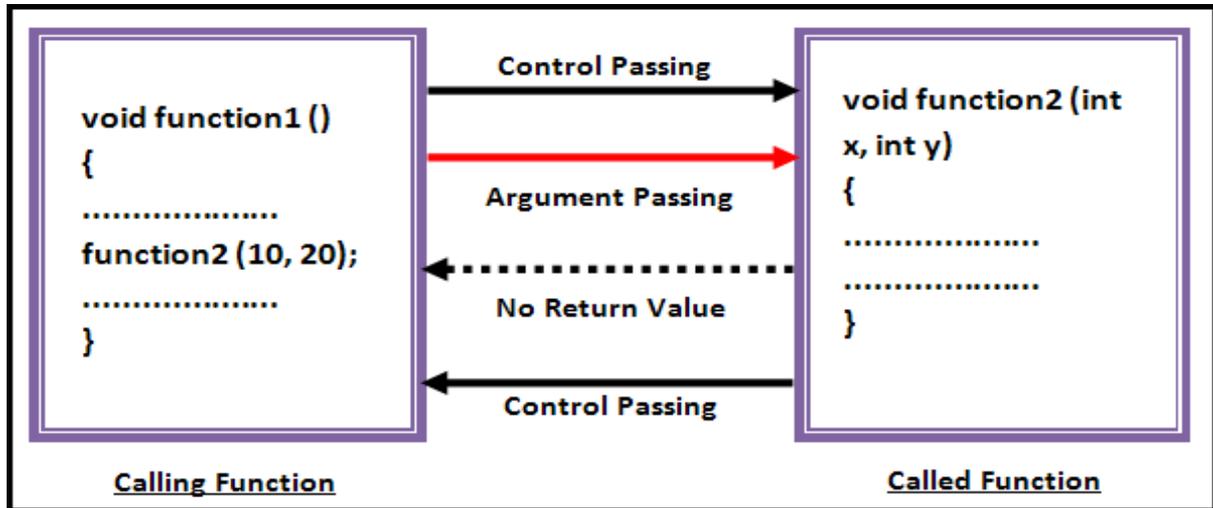
- This type of function receive some value but never return some value.

  Example :-
  ```
  void sk(int);    //function prototype
  Void main()
  {
       Int i=10;
       sk(i);    //function calling
       Printf("%d",c);
       getch();
  }

  void sk(int n) //function definition
  {
       Printf("%d",n);
  }
  ```

✓ **with argument with return:-**

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- This type of function receive some value and also return some value.

Example :-
```
 int sk(int,int);     //function prototype
 Void main()
 {
      Int  a=10,b=20,c;
      c=sk(a,b);    //function calling
      Printf("%d",c);
      getch();
 }
 int sk(int x , int y) //function definition
 {
      int z; z=x+y;
      return(z);
 }
```

1 Word Question – Answer

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1	How many types of UDF?	4
2	List out types of User defined function.	*No argument No return *With argument No return *No argument with return *With argument with return

Q-5 Explain Pointer in brief.

WHAT IS POINTER?

- A **pointer** is a variable whose value is the address of another variable, i.e., direct address of the memory location. Like any variable or constant, you must declare a pointer before you can use it to store any variable address.
- The general form of a pointer variable declaration is:

  dataType *var_name;

- Here,
  - **dataType** is the pointer's base type; it must be a valid C data type(i.e., int, float, char etc).
  - **var_name** is the name of the pointer variable.
  - The asterisk * you used to declare a pointer is the same asterisk that you use for multiplication. However, in this statement the asterisk is being used to designate a variable as a pointer.

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Pointer Declaration

- **Type * Varname;**
  declares **Varname** as a pointer to **Type**

- **Examples**

  `char* A;` → A is a pointer to a character

  `int* B;` → B is a pointer to an integer

  `struct node * Root;` → Root is a pointer to a node structure

- *** associates with the variable name**

  `char *A, B;`

  A is a pointer to a character   B is a character !

  Pg. 9

Detail :-

- Pointer is a user defined data type.
- Pointer is variable that store memory address of another variable.
- Pointer is used to point out the memory address.
- Pointer have three main concept:

✓ **Pointer Constant :-**
  - In pointer the memory address is known as pointer constant .
  - We can not change its value.

✓ **Pointer Value:-**
  - A pointer value means address of another variable.
  - If we want to access value of memory address then we have to use * (astrik) Operator.

✓ **Pointer Variable:-**

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▪ It is variable that store

pointer value like;int a=5
//simple variable
int *ptr; **// pointer variable**

ptr=&a; **//address of a**

Explanation:

About variable a:
- ✓ Name of the variable: a
- ✓ Value of the variable which it keeps: 5
- ✓ Address where it has stored in the memory : 1025 (assume)

About variable ptr:
- ✓ Name of the variable : ptr
- ✓ Value of the variable which it keeps : 1025
- ✓ Address where it has stored in the memory : 5000 (assume).
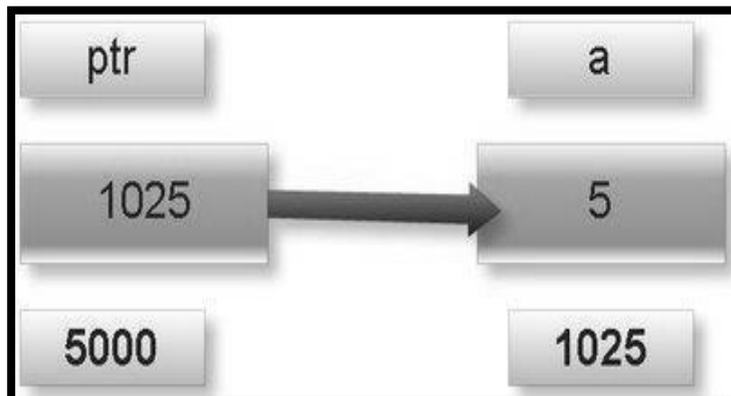
Note:

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➢   * is known as indirection operator which gives the content of any variable.

➢   & is known as reference operator which gives addresswhere variable has stored in memory.

1 Word Question – Answer

1	Pointer is_____datatype.	User defined
2	Pointer is a variable that store_____ of another variable.	Memory address
3	_____is known as indirection operator which gives the content of any variable.	Astrik(*)
4	_____is known as reference operator which gives address where variable has stored in memory.	Ampersand(&)

Q-6 Explain Call by Value and Call by Reference with example.

Detail :-

- In c language , arguments can be passed by two ways:
  - ✓ Call by value
  - ✓ Call by reference

1. Call by value :-

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- In call by value the copy of real argument will be passed to formal argument.
- By default , c language use call by value to pass the argument.

Call by value

● Calling a function with parameters passed as values

```
int a=10;              void fun(int a)
fun(a);                {
                               defn;
                       }
Here fun(a) is a call by value.
```
Any modification done within the function is local to it and will not be effected outside the function

Example :-

```
Void swap(int , int);
Void main()
{
        Int a=5,b=10;
        Clrscr();

Printf("before swapping a=%d , b=%d",a,b);
    Swap(a,b);
Printf("after swapping a=%d,b=%d",a,b);

Getch();
}
```

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```
        Void swap (int x , int y)
    {

            Int temp;
            temp =x;
            x=y;
            y=temp;
            Printf("x=%d",x);
            Printf("\ny=%d",y);
    }
```

2. <u>Call by Reference :-</u>

- In call by reference the address of real argument will be passed toformal argument.
- So that the changes made to formal arguments wil be reflect thereal argument.

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Example :-

```
Void swap(int *, int *);
Void main()
 {
      Int a=5,b=10;
      Clrscr();
      Printf("before swapping a=%d , b=%d",a,b);
      Swap(&a,&b);
      Printf("after swapping a=%d,b=%d",a,b);
      getch();
}

Void swap (int  *x , int *y)
{

      Int temp;
      temp =*x;
      *X=*y;
      *Y=temp;
      printf("x=%d",*x);
      printf("\ny=%d",*y);
}
```

Q-7 Explain Recursion with example.

Detail :-

- In c language , Recursion is a process of repeating the value number of times.
- In programming language ,recursion means when the function call itself again and again.

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- But in recursion function programmer have to mention ,when to exit.
- You have to use same name when calling the function.

RECURSION

When a called function in turn calls another function a process of chaining occurs. Recursion is a special case of this process, where a function calls itself.

Example :

```
void main ( )
{
printf ( " \n This is an example of recursion");
main ( ) ;     ←           Recursive function
                                    call
}
```


Recursive Definitions

- Recursion: solving a problem by reducing it to smaller versions of itself
- $0! = 1$ (1)
  $n! = n \times (n-1)!$ if $n > 0$ (2)
- The definition of factorial in equations (1) and (2) is called a recursive definition
- Equation (1) is called the base case
- Equation (2) is called the general case

C++ Programming: From Problem Analysis to Program Design, Third Edition   3


```
return 5 * factorial(4) = 120
    └─ return 4 * factorial(3) = 24
        └─ return 3 * factorial(2) = 6
            └─ return 2 * factorial(1) = 2
                └─ return 1 * factorial(0) = 1
```
javaTpoint.com

$1 * 2 * 3 * 4 * 5 = 120$

Fig: Recursion

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Example :-

```
Void rec(int);
Void main()
{
     Printf("enter number");
    Scanf("%d",&n);
    rec(n);
     getch();
}
Void rec(int n)
{
    n++;
    if(n>5)
    {
         Printf("%d\n",n);
        rec(n);
    }
}
```

1 Word Question – Answer

1	when the function call itself again and again ,the process is called _____	recursion
2	The function being called again by itself is called _____	Recursive function

Q-8 Explain different storage classes.

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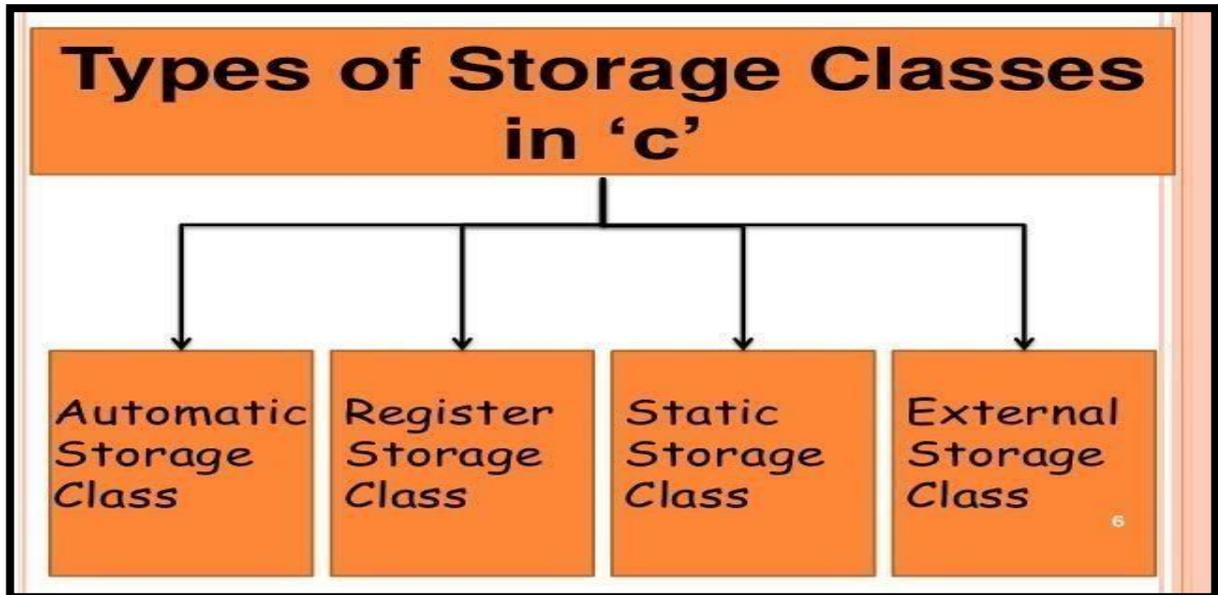
Detail :-

- In c language , Storage class is used to decide storage of memory for particular variable.
- It is used to decide the scope of variable.

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- There are four storage classes available in c.
  - Automatic Storage class
  - Register Storage class
  - Static Storage class
  - External Storage Class

1. __Automatic Storage Class:__

- A variable that declare inside function block is called automatic variable.
- It must be declare using auto keyword.

  - ✓ **Keyword** : auto
  - ✓ **Storage Location** : Main memory
  - ✓ **Initial Value** : Garbage Value
  - ✓ **Life** : Local (function in which it is declared).
  - ✓ **Scope** : Local to the block in which variable is declared.

Storage Class	Declaration Location	Scope (Visibility)	Lifetime (Alive)
auto	Inside a function/block	Within the function/block	Until the function/block completes
register	Inside a function/block	Within the function/block	Until the function/block completes
extern	Outside all functions	Entire file plus other files where the variable is declared as extern	Until the program terminates
static (local)	Inside a function/block	Within the function/block	Until the program terminates
static (global)	Outside all functions	Entire file in which it is declared	Until the program terminates

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Example:

```
#include  <stdio.h>
#include <conio.h>
void main()
 {
       auto int i=10;
       clrscr();

              {

                     auto int i=20;
                     printf("\n\t %d",i);

              }
                     printf("\n\n\t %d",i);
              getch();
       }
```

2. **External Storage Class:**
   - This variable can be declare outside the function (extern).
   - The extern variable can be declare using extern keywords.

     ✓ **Keyword** : extern
     ✓ **Storage Location** : Main memory
     ✓ **Initial Value** : Zero
     ✓ **Life** : Until the program ends.
     ✓ **Scope** : Global to the program.

     Example:
```
#include <stdio.h>
#include <conio.h>
extern int i=10;
```

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```
void main()
{
        int i=20;
        void show(void);
        clrscr();
        printf("\n\t %d",i);
        show();
        getch();
}
void show(void)

{
        printf("\n\n\t %d",i);

}
```

3. **Static Storage Class:**
    - This variable can be declare inside the function and local to the block in whichit is declare.
    - Static variable can be declare using static keyword.

    ✓ **Keyword :** static
    ✓ **Storage Location** : Main memory
    ✓ **Initial Value**: Zero and can be initialize only once.
    ✓ **Life** : depends on function calls and the whole application orprogram.
    ✓ **Scope** : Local to the block.

    Example:
```
#include<stdio.h>
#include<conio.h>
void print();
void main()
```

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```
        {
             clrscr();
             print();
             print();
             getch();
        }
        void print()
        {
                  static int k;
                  printf("\n the value of static variable is %d",k);
                  k++;


        }
```

4.   Register Storage Class:

- This variable can be declare inside the function as well as outside the function.
- The scope of this variable is global.
- It is declare using register keyword.
  - ✓ **Keyword** : register
  - ✓ **Storage Location** : Register Memory
  - ✓ **Initial Value** : Zero
  - ✓ **Life** : Until the program ends.
  - ✓ **Scope** : Global to the program.

Example:
```
#include<stdio.h>
#include<conio.h>
void main()
 {
      clrscr();
      register int i;
```

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```
        for(i=0;i<=4;i++)

        {
            Printf("%d\n",i);
        }
    getch();
    }
```

1 Word Question – Answer

1	How many types of storage classes available in c?	4
2	The register storage class can be declare using _____keyword.	Register
3	Storage location of static storage class is _____.	Main memory
4	The initial value of external variable is_____.	
5	The scope of automatic variable is _____to the block where it is declared.	

Q-9 Explain How to Pass and How to return argument or value.

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Detail :-

When a function passes and returns value of variables then that functionis known as **'function call by passing and returning values.'**

Example:

```c
#include <stdio.h>
#include<conio.h>
int number(int n)
{
        return n;
}
void main()
{

int number(int);
```

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```
        int a = number(4);

        clrscr();
            printf("\n Number is : %d",a);
            getch();
    }
```

Q-10 Give difference between Malloc() and Calloc().

malloc()	calloc()
1. malloc() has only oneargument. 2. malloc() allocates singleblock of storage space 3. malloc() gives the garbage value of memory	1. calloc() has two arguments. 2. calloc() allocates multipleblocks of storage space. 3. calloc() initializes thememory to zero.

Q-11 Give difference between Call by value and Call by reference.

Call by value	Call by reference
1) In call by value the real argument will remain unchanged. 2) In call by value copy of argument will be passed.	1) In call by reference the realargument can be easily modified. 2) In call by reference ,addressof argument can be passed.
3) In this process ,user canpass the value.	3)In this process , user can pass address or reference.

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SUMMARY QUESTIONS OF CHAPTER -3

ONE - MARK QUESTIONS

- ✓ What is Function?
- ✓ Give Full Form of UDF.
- ✓ List out Types of UDF.
- ✓ Which Operator is used to declare Pointer Variable?
- ✓ List out different Memory Allocation Functions.
- ✓ Write down Syntax for Realloc()

TWO - MARK QUESTIONS

- ✓ Explain any two String Functions with Example.
- ✓ Explain any two Maths Functions with Example.
- ✓ Explain any two Date & Time Functions with Example.

THREE - MARK QUESTIONS

- ✓ Explain Recursion with suitabale Example.
- ✓ Explain any three I/O Formatting functions with Example.
- ✓ Explain Free() , Exit() ,atof() ,atol() with Example.
- ✓ Give difference between Malloc() and Calloc().

FIVE - MARK QUESTIONS

- ✓ Explain any six Miscellaneous Functions with Example.
- ✓ Explain Pointer with Suitable Example.
- ✓ Explain Call by Value and Call by Reference with Example.
- ✓ Write note on different Storage Classes.
- ✓ Explain User Define Function with Example.