CMRIT

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Internal Assessment Test 1 – January 2022

Solution/Model Answer

Sub:	**Problem solving through Programming**	**Sub Code:**	**21PSP13**	**Sem/Sec: I Sem (I, J, K, L, M, N,O)**

	Answer any FIVE FULL Questions	**Total Marks**
1 (a)	Describe various types of computers according to the purpose, size, and speed. Ans: According to purpose: Analog, Digital, Hybrid • Analog computers are mainly used to measure physical units like the voltage, pressure, electric current, temperature, and convert them into digits. Eg. Thermometer • Digital Computer represents and calculates the digital letters, numerical values, or any other special symbols for processing the data. Example : PCs • Hybrid Computer is a combined complex computer of both the properties of analog and digital and united by a single control system. Example: Super computer According to size and speed: Super, Main Frame, Mini, Micro(PC-Desktop, Laptop, Palmtop, Note book, Tablet, Pocket- smart Phone) • A Supercomputer is the very fastest and powerful, and expensive type of computer for processing data. A super computer is multi-specific task Example: CRAY • Mainframe computers are multi-programming, high-performance computers, and multi-user, which means it can handle the workload of more than 100 users at a time on the computer. Ex. IBM Ex Series • Minicomputer is a digital and multi-user computer system with the connection of more than one CPU. Thus, many people can work on these computers simultaneously instead of a single person. Also, it can process with other accessories like a printer, plotter, etc. these computers are currently used to store large databases, multi-user applications, and the automation industry. Example: PDP 11 and IBM 8000 series • Today we are using many computers at home is also the most common microcomputer. With this invention of the microprocessors in the year 1970, it became possible to use computers for people personally at a low cost and reasonable price known as Digital Personal Computer. Examples: Lenovo, Del, HCL Again this led to Notebook, tablets and smart phones.	[5]
1 (b)	Explain Various types of Computer Networks: PAN, LAN, MAN, WAN Ans: • PAN (Personal Area Network): Personal Area Network (PAN) is a the computer network that connects computers/devices within the range of an individual person. As PAN provides a	[5]

network range within a person’s range typically within a range of 10 meters(33 feet) it is called as Personal Area Network

- LAN(Local Area Network): A group of computers & devices connected together, usually within the same building or in same campus is LAN.
- MAN(Metropolitan Area Network): MAN is a larger network that usually spans several buildings in the same city or town. The Dish TV network is an example of a MAN.
- WAN(Wide Area Network): A WAN (wide area network), in comparison to a MAN, is not restricted to a geographical location, although it might be confined within the bounds of a state or country. A WAN connects several LANs, and may be limited to an enterprise (a corporation or an organization) or accessible to the public. The technology is high speed and relatively expensive.

2(a) Differentiate between Primary Memory and Secondary Memory [5]

Ans:

Primary memory is the computer memory that is directly accessible by CPU. It is comprised of DRAM and provides the actual working space to the processor. It holds the data and instructions that the processor is currently working on.

The contents of the secondary memory first get transferred to the primary memory and then are accessed by the processor, this is because the processor does not directly interact with the secondary memory.

Sr.No.	**Primary memory**	**Secondary memory**
1.	Primary memory is temporary.	Secondary memory is permanent.
2.	Primary memory is directly accessible by Processor/CPU.	Secondary memory is not directly accessible by the CPU.
3.	Nature of Parts of Primary memory varies, RAM- volatile in nature. ROM- Non-volatile.	It’s always Non-volatile in nature.
4.	Primary memory devices are more expensive than secondary storage devices.	Secondary memory devices are less expensive when compared to primary memory devices.
5.	The memory devices used for primary memory are semiconductor memories.	The secondary memory devices are magnetic and optical memories.
6.	Primary memory is also known as Main memory or Internal memory.	Secondary memory is also known as External memory or Auxiliary memory.

2(b) List and explain various categories of software available in a computer. [5]

Ans:

A. System Software

Software required to run the hardware parts of the computer and other application software are called system software. System software acts as interface between hardware and user applications. An interface is needed because hardware devices or machines and humans speak in different languages.

Machines understand only binary language i.e. 0 (absence of electric signal) and 1 (presence of electric signal) while humans speak in English, French, German, Tamil, Hindi and many other languages. English is the pre-dominant language of interacting with computers. Software is required to convert all human instructions into machine understandable instructions. And this is exactly what system software does.

Based on its function, system software is of following types −

Operating System

Language Processor

Device Drivers

Operating System

System software that is responsible for functioning of all hardware parts and their interoperability to carry out tasks successfully is called operating system (OS). OS is the first software to be loaded into computer memory when the computer is switched on and this is called booting. OS manages a computer's basic functions like storing data in memory, retrieving files from storage devices, scheduling tasks based on priority, etc.

Language Processor

An important function of system software is to convert all user instructions into machine understandable language.

Program written in high level programming languages like Java, C++, etc. is called source code. Set of instructions in machine readable form is called object code or machine code. System software that converts source code to object code is called language processor. There are three types of language interpreters−

Assembler − Converts assembly level program into machine level program.

Interpreter − Converts high level programs into machine level program line by line.

Compiler − Converts high level programs into machine level programs at one go rather than line by line.

Device Drivers

System software that controls and monitors functioning of a specific device on computer is called device driver. Each device like printer, scanner, microphone, speaker, etc. that needs to be attached externally to the system has a specific driver associated with it. When you attach a new device, you need to install its driver so that the OS knows how it needs to be managed.

B. Application Software

A software that performs a single task and nothing else is called application software. Application software are very specialized in their function and approach to solving a problem. So, a spreadsheet software can only do operations with numbers and nothing else. A hospital management software will manage hospital activities and nothing else. Here are some commonly used applications software −

Word processing

Spreadsheet

Presentation

Database management

Multimedia tools

C. Utility Software

Application software that assists system software in doing their work is called utility software. Thus, utility software is a cross between system software and application software. Examples of utility software include −

Antivirus software

Disk management tools

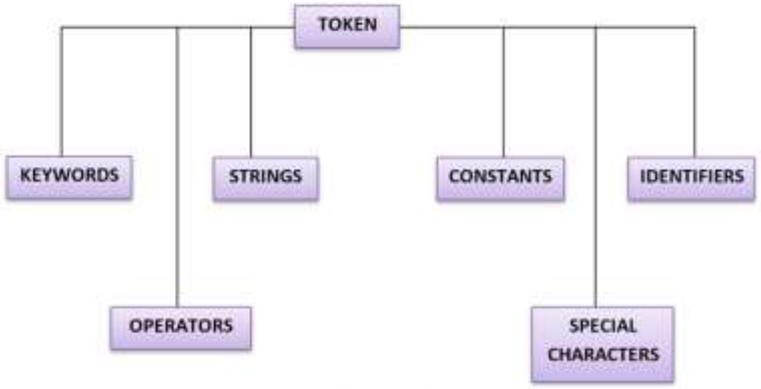
File management tools

Compression tools

Backup tools

3 (a) List different types of tokens available in C language. Briefly explain Keyword, identifier, string, special character with suitable example. [5]

Ans:



Tokens in C

Keywords have fixed meanings, and the meaning cannot be changed. They act as a building block of a ‘C’ program. There are a total of 32 keywords in ‘C’. Keywords are written in lowercase letters.

Following table represents the keywords in ‘C’-

Keywords in C Programming Language			
auto	double	int	struct
break	else	long	switch
case	enum	register	typedef
char	extern	return	union
const	short	float	unsigned
continue	for	signed	void
default	goto	sizeof	volatile
do	if	static	while

An **identifier** is nothing, but a name assigned to an element in a program. Example, name of a variable, function, etc. Identifiers in C language are the user-defined names consisting of ‘C’ standard character set. As the name says, identifiers are used to identify a particular element in a program. Each identifier must have a unique name. Following rules must be followed for identifiers:

1. The first character must always be an alphabet or an underscore.
2. It should be formed using only letters, numbers, or underscore.
3. A keyword cannot be used as an identifier.
4. It should not contain any whitespace character.
5. The name must be meaningful.

- **Strings in C**

Strings in C are always represented as an array of characters having null character '\0' at the end of the string. This null character denotes the end of the string. Strings in C are enclosed within double quotes, while characters are enclosed within single characters. The size of a string is a number of characters that the string contains.

- **Special characters in C**

Some special characters are used in C, and they have a special meaning which cannot be used for another purpose.

3 (b) Classify following as valid/invalid identifier: [5]

(a) num1 (b)$num1 (c) +add (d) 1st_paper_marks (e) 9ab_c

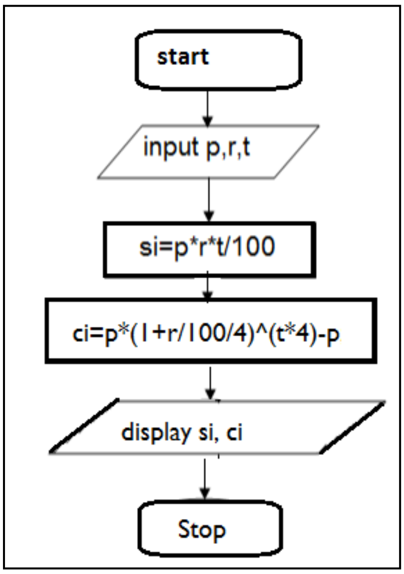
Ans:

(a) num1 - valid
(b)$num1 - invalid
(c) +add - invalid
(d) 1st_paper_marks - invalid
(e) 9ab_c - invalid

4 Draw the flowchart, write algorithm & Program to compute simple compound interest. [10]

Ans:

- Flowchart



- Algorithm

```
Start
Step 1: read input p,t,r
Step 2: calculate si=p*t*r/100
Step 3: calculate  ci=p*pow((1+r/100/4),(t*4))-p
Step 4: display si, ci
Stop
```

- Program

```
#include <stdio.h>
#include <math.h>
int main( )
{
  float p,r,t,si,ci;
  printf("Enter principle, rate and time : ");
  scanf("%f%f%f", &p, &r, &t);
  si=p*r*t/100.00;
  ci=p*pow((1+r/100/4),(t*4))-p;  /* quarterly compounded */
```

```
   printf("Simple interest = %.2f\n", si);
   printf("Compound interest = %.2f\n", ci);
   return 0;
}
```

(or)

```
#include <stdio.h>
#include <math.h>
int main()
{
            float p, r, t, a, si, ci;
            printf("Enter Principle=");
            scanf("%f",&p);
            printf("Enter Rate=");
            scanf("%f",&r);
            printf("Enter Time=");
            scanf("%f",&t);
            si=(p*r*t)/100;
            printf("Simple Interest=%f",si);
            a = p*(pow((1 + r / 100), t));
            ci =  a - p;
            printf("\nCompound Interest=%f",ci);
            return 0;
}
```

5(a) Write the structure of a C Program with example. [6]

Ans:

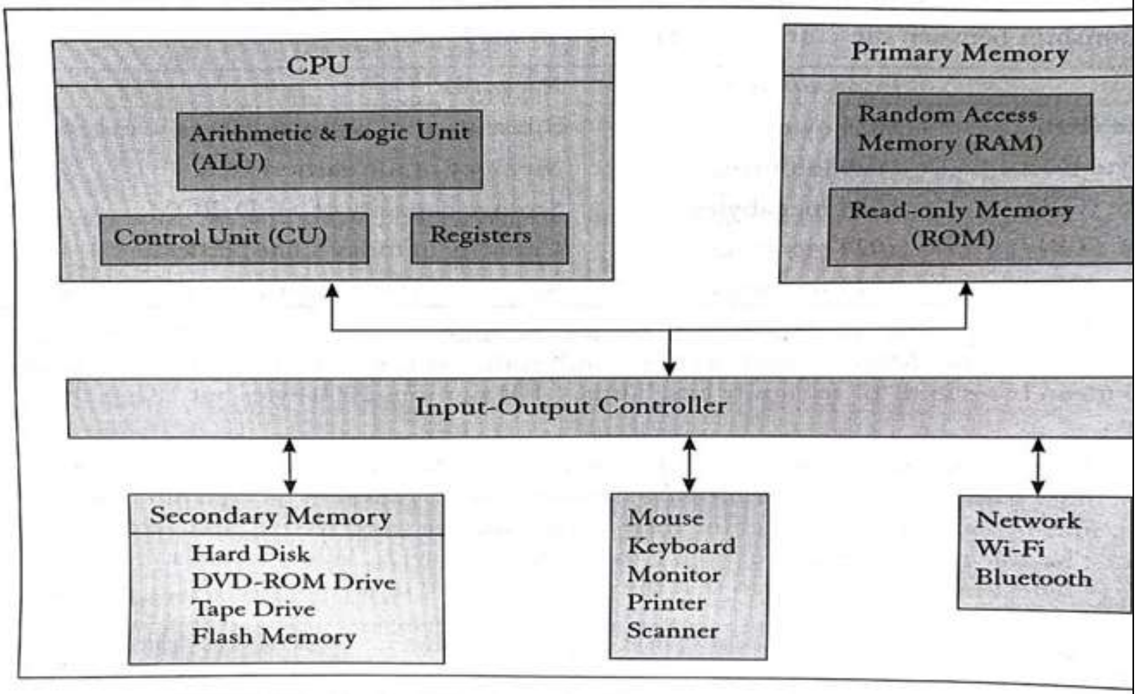
A C program is divided into different sections:

```
            1 ) Comment line
            2) Preprocessor directive
            3 ) Global variable declaration
            4) main function( )
            { Local variables;
            Statements;
            }
            User defined function
            }
            }
```

Any Example C Program can be written.

Program to Display "Hello, World!"

```
#include <stdio.h>
int main()
{
printf("Hello, World!");
   return 0;
}
```

5(b)	(i) W.r.t the given statements, find the final value of ‘x’ (a)int a,b; float x; a=4; b=5; x=b/a ; (b)int a,b; float x; a=4; b=5; x=(float)b/a; (ii) Convert following mathematical expressions into equivalent C language expressions: (a) area = $\sqrt{s(s-a)(s-b)(s-c)}$ (b) $\frac{-b+\sqrt{b^2-4ac}}{2a}$. Ans: (i) (a) x=1.00 (b) x=1.25 (ii) (a) area=sqrt(s*(s-a)*(s-b)*(s-c)) (b)(-b+ sqrt(b*b-4*a*c))/(2*a)	[4]
6(a)	Draw the block diagram of Computer displaying its components. Ans:  CPU Arithmetic & Logic Unit (ALU) Control Unit (CU) Registers Primary Memory Random Access Memory (RAM) Read-only Memory (ROM) Input-Output Controller Secondary Memory Hard Disk DVD-ROM Drive Tape Drive Flash Memory Mouse Keyboard Monitor Printer Scanner Network Wi-Fi Bluetooth	[5]
6(b)	Explain 5 Generations of the computer Ans: **Vacuum Tubes: The First Generation** □Memory requirements were met by magnetic drums (forerunner of today's hard disk). □Because of the size of vacuum tubes, first generation computers took up a lot of space. □They also consumed enormous amounts of power and generated a lot of heat. Despite housing these computers in air-conditioned enclosures, frequent breakdowns were common. □The ENIAC used 18,000 vacuum tubes, occupied 1800 sq. ft. of room space and consumed 180KW of power. □Machines of this generation were prohibitively expensive to buy and maintain. □First-generation computers were programmed using a first-generation language-machine language. □Program input was provided by punched cards and output was obtained on paper.	[5]

□First-generation computers were only used for scientific work and were not deployed commercially.

Transistors: The Second Generation

□Compared to vacuum tubes, transistors were faster, smaller and consumed less power smaller magnetic cores also replaced the first- generation magnetic drums.

□Even though transistor generated less heat, second-generation computers still needed air-conditioning.

□The input-output mechanism however remained largely unchanged.

□Second-generation computers were programmed using a symbolic or assembly language.

□The computers also implemented the stored program concept which allowed both program and data to reside in memory.

□Higher level languages like COBOL language for most applications and FORTRAN also began to make their appearance.

Integrated Circuits: The Third Generation

□By virtue of miniaturization, computers consequently got smaller, cheaper and energy efficient. For these reasons, they could be seen in several medium-sized organizations.

□This generation adopted a keyboard and monitor to interact with the user.

□Memory capacity increased substantially, and the magnetic hard disk was used for secondary storage.

□Third-generation computers also had an operating system, which is a special program meant to control the resources of the computer.

□By virtue of a feature known as time sharing, the computer could run programs invoked by multiple users.

□The existing programming languages were supplemented by BASIC, C, C++ and Java.

The Microprocessor: The Fourth Generation

□The integration of components went several steps ahead. Using LSI and VLSI technology, it is now possible to have the entire CPU, its associated memory and input/output control circuitry on a single chip.

□Intel introduced the 4004 microprocessors in 1971 and improvement in the usual parameters (like speed, heat generation, size, etc.) continues at a frenetic pace to this day.

□Microprocessors have invaded our homes to drive desktops, laptops, smartphones, microwave ovens and washing machines.

□Laptops and smartphones offer gigabytes (GB) of memory compared to a few megabytes (MB) that were available in the early days of this generation.

□Operating systems have moved from the rudimentary MSDOS to a mouse based Graphical User Interface (GUI) like Windows. More advanced systems like Linux are now available for desktops and laptops, and a variant of it (Android) powers most of our smartphones.

□There have been other sweeping changes in this generation. Laptops and smartphones offer Fourth generation languages (4GLs), which resemble natural languages, have also come into being.

□This generation has also made a rapid strides in networking technology, sharing of information, became possible by connecting computers in a network using TCP/IP technology.

Artificial Intelligence: The Fifth Generation

□The fifth generation represents a vision of the computers of the future. The conventional parameters of computing (speed, size, energy consumption, VLSI to UL.SI, etc.) would continue to improve path-breaking changes in the way we use computers are also expected.

□Fifth-generation systems should be capable of producing human-like behaviour. These systems expected to interact with users in natural language and learn from experience. Speech recognition and speech output should also be possible with these systems.

□Computer speeds need to make an exponential jump, a feat that would be possible using quantum computers. Google's D-Wave 2X quantum computer is 100 million times faster than today's machines.

□Computers must be able to perform parallel processing so that multiple processors concurrently handle different aspects of a problem.

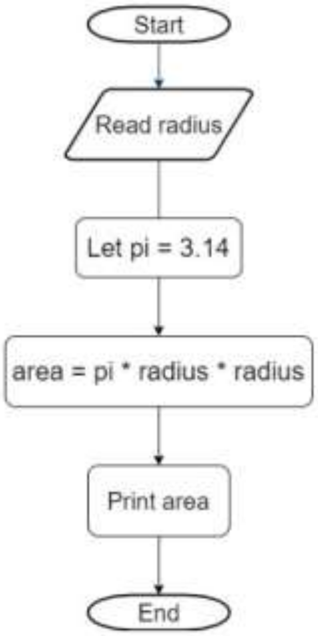
□Neural networks and expert systems have to be developed. These applications would be able to make decisions and advise humans by analysing data using human-like intelligence but without using the services of an expert.

□Other possibly disruptive technologies-like molecular computing that could take miniaturization to molecular levels.

7(a) Write a C program to find area of a circle for the given radius. Also write the algorithm and draw a flowchart for the same [5]

Ans:

- Flowchart



- Algorithm

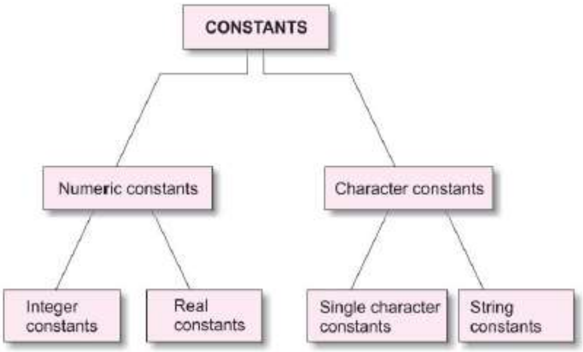
```
Start
Step 1: Input radius
Step 2: let pi = 3.14
Step 3: area = pi * radius * radius
Step 4: print area
stop
```

- Program

```
#include < stdio.h >
#include < conio.h >
 #define PI 3.141
int main()
{
    float radius, area;
    printf("Enter radius of circle\n");
    scanf("%f", & radius);
    area = PI * radius * radius;
    printf("Area of circle : %0.4f\n", area);
    return 0;
}
```

7(b) List & explain various types of constants available as C token (Ex: integer, real, string and character constants) [5]

Ans:



1. Numeric Constants
   - Integer Constants
   - Real Constants
2. Character Constants
   - Single Character Constants
   - String Constants
   - Backslash Character Constants

Integer Constants

It's referring to a sequence of digits. Integers are of three types viz:

1. Decimal Integer
2. Octal Integer
3. Hexadecimal Integer

Example:

15, -265, 0, 99818, +25, 045, 0X6

Rules for Constructing Integer Constants:

An integer constant must have at least one digit.

a) It must not have a decimal point.

b) It can be either positive or negative.

c) If no sign precedes an integer constant it is assumed to be positive.

d) No commas or blanks are allowed within an integer constant.

e) The allowable range for integer constants is -32768to 32767.

Ex.: 426, +782,-8000, -7605

Real Constants

The numbers containing fractional parts like 99.25 are called real or floating points constant.

Rules for Constructing Real Constants:

Real constants are often called Floating Point constants. The real constants could be written in two forms—Fractional form and Exponential form.

Rules for constructing real constants expressed in fractional form:

a) A real constant must have at least one digit.

b) It must have a decimal point.

c) It could be either positive or negative.

d) Default sign is positive.

e) No commas or blanks are allowed within a real constant.

Ex. +325.34, 426.0, -32.76, -48.5792

Rules for constructing real constants expressed in exponential form:

a) The mantissa part and the exponential part should be separated by a letter e.

b) The mantissa part may have a positive or negative sign.

c) Default sign of mantissa part is positive.

d) The exponent must have at least one digit, which must be a positive or negative integer.

Default sign is positive.

e) Range of real constants expressed in exponential form is -3.4e38 to 3.4e38.

Ex. +3.2e-5, 4.1e8, -0.2e+3, -3.2e-5

Single Character Constants

It simply contains a single character enclosed within ' and ' (a pair of single quote). It is to be noted that the character '**8**' is not the same as **8**. Character constants have a specific set of integer values known as ASCII values (American Standard Code for Information Interchange).

Example:

'X', '5', ';'

Rules for Constructing Character Constants:

a) A character constant is a single alphabet, a single digit or a single special symbol enclosed within single inverted commas.

b) The maximum length of a character constant can be 1 character.

Ex.: ‘M’, ‘6’, ‘+’

String Constants

These are a sequence of characters enclosed in double quotes, and they may include letters, digits, special characters, and blank spaces. It is again to be noted that "**G**" and '**G**' are different - because "G" represents a string as it is enclosed within a pair of double quotes whereas 'G' represents a single character.

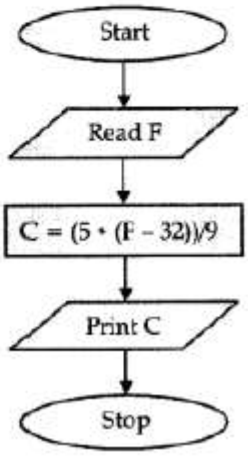
Example:

"Hello!", "2015", "2+1"

8(a) Write algorithm and flowchart to convert Fahrenheit temperature to Centigrade [5]

Ans:

- Flowchart



- Algorithm

Start
Step 1: Read temperature in Fahrenheit,
Step 2: Calculate temperature with formula C=5/9*(F-32),
Step 3: Print C
Stop

8(b) Define data type. Explain fundamental data types of C language with their size. [5]

Ans:

- ❖ **Data Types**

Data types in c refer to an extensive system used for declaring variables or functions of different types. The type of a variable determines how much space it occupies in storage and how the bit pattern stored is interpreted.

Basic/ Primary Data Types

Int

Integers are whole numbers that can have both zero, positive and negative values but no decimal values. For example, 0, -5, 10

We can use int for declaring an integer variable.

int id;
Here, id is a variable of type integer.

float and double

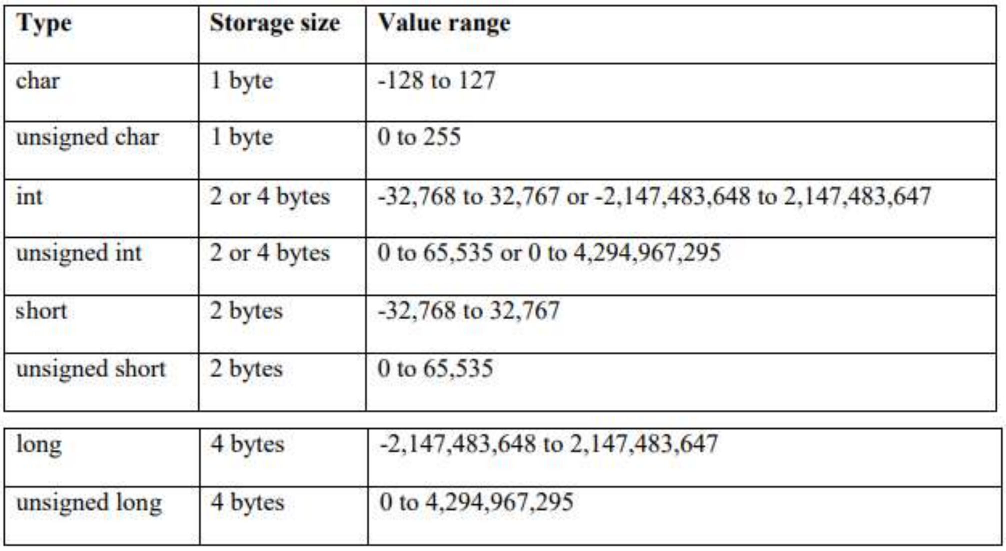
float and double are used to hold real numbers.

float salary;
double price;

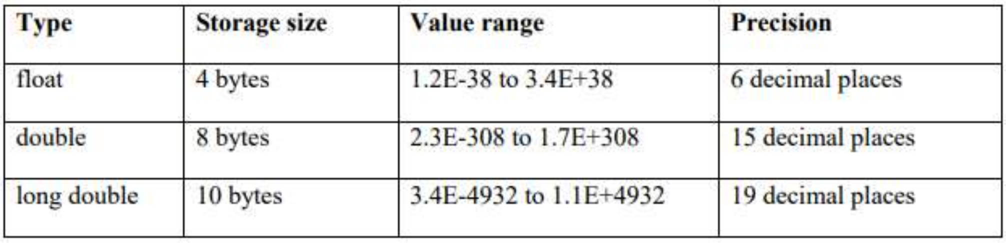
char

Keyword char is used for declaring character type variables. For example,

char test = 'h';



Type	Storage size	Value range
char	1 byte	-128 to 127
unsigned char	1 byte	0 to 255
int	2 or 4 bytes	-32,768 to 32,767 or -2,147,483,648 to 2,147,483,647
unsigned int	2 or 4 bytes	0 to 65,535 or 0 to 4,294,967,295
short	2 bytes	-32,768 to 32,767
unsigned short	2 bytes	0 to 65,535
long	4 bytes	-2,147,483,648 to 2,147,483,647
unsigned long	4 bytes	0 to 4,294,967,295



Type	Storage size	Value range	Precision
float	4 bytes	1.2E-38 to 3.4E+38	6 decimal places
double	8 bytes	2.3E-308 to 1.7E+308	15 decimal places
long double	10 bytes	3.4E-4932 to 1.1E+4932	19 decimal places