BUDDHA SERIES

(Unit Wise Solved Question & Answers)

Course – B.Tech (ASH)

College – Buddha Institute of Technology

(AKTU CODE-525)

Department: Applied Science and Humanities

Subject: Programming for Problem Solving (BCS-101/201)

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Unit - 1

Short Answer type question

1) Differentiate between algorithm and program.

(B.TECH-(SEM II) 2022-23)

Answer:-

Algorithm	Program
It is a well-defined, step-by-step, logical procedure for solving a given problem.	It refers to a set of instructions for a computer to follow. A program can implement many algorithms, or a program can even contain no algorithms.
An algorithm provides abstract steps for processing one sequence of related information into a different sequence of derived information.	The constituents of a program may not be conceptually related.
It is written using plain English language and can be understood by those from a non-programming background.	It could be written in any programming language, such as Python, Java, C++, JavaScript, or any other language, depending on the particular task the program is designed for.

2) Discuss the functions of an operating system in brief.

(B.TECH-(SEM II) 2022-23, 2019-20)

Answer: - Functions of an Operating System

1) **Memory Management: -** Allocates and deallocates the memory, Keeps a record of which part of primary memory is used by whom and how much.

2) **Processor Management: -** Allocates and deallocates processor to the processes, Keeps record of CPU status.
3) **Device Management: -** Allocates and deallocates devices to different processes, Keeps records of the devices, Decides which process can use which device for how much time.
4) **File Management: -** Keeps records of the status and locations of files, Allocates and deallocates resources, Decides who gets the resources.

3) Draw memory hierarchical structure of a computer system.

(B.TECH-(SEM I) 2022-23, 2021-22)

Answer:-

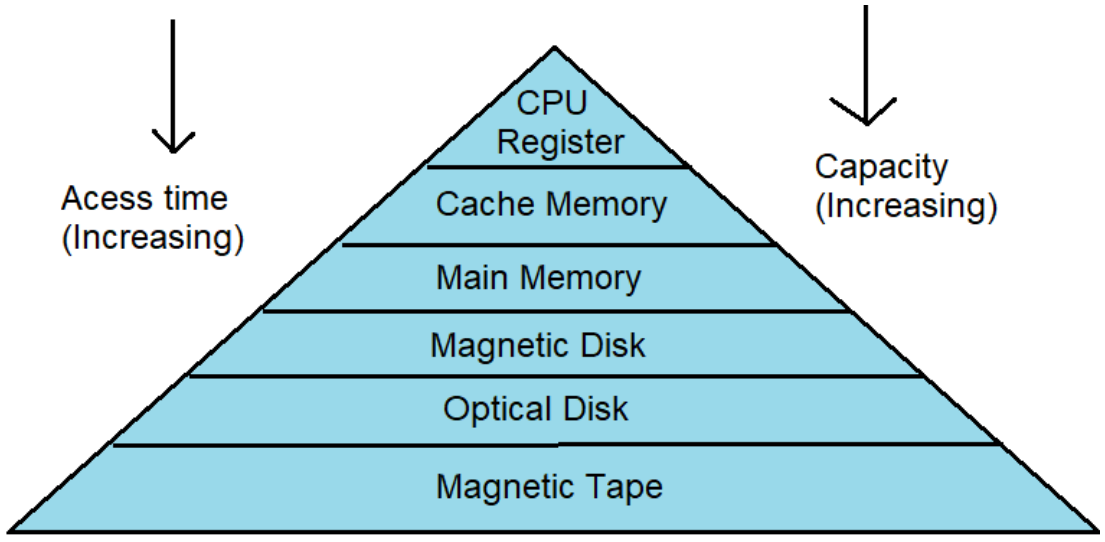


Fig:- Memory Hierarchy

4) Differentiate between void and int datatypes.

(B.TECH-(SEM II) 2021-22)

Answer: - A void function doesn't return any value. An int function returns an integer value unlike void. Also, float ones return float value, char one return char... etc. void represents absence of data. Int represents an integer element. Void means they have no return type of function and int function means that function return integer value after execution of the code.

5) Differentiate between algorithm and pseudocode.

(B.TECH-(SEM I) 2021-22)

Answer:-

Algorithm	Pseudocode

It is defined as a sequence of well-defined steps. These steps provide a solution/ a way to solve a problem in hand.	It can be understood as one of the methods that helps in the representation of an algorithm.
It is a systematic, and a logical approach, where the procedure is defined step-wise	It is a simpler version of coding in a programming language.
Algorithms can be represented using natural language, flowchart and so on.	It is written in plain English, and uses short phrases to write the functionalities that s specific line of code would do.
This solution would be translated to machine code, which is then executed by the system to give the relevant output.	There is no specific syntax which is actually present in other programming languages. This means it can't be executed on a computer.

6) Write the algorithm for addition of two numbers.

(B.TECH-(SEM I) 2020-21)

Answer:-

Step 1: Start

Step 2: Declare variables num1, num2 and sum.

Step 3: Read values for num1, num2.

Step 4: Add num1 and num2 and assign the result to a variable sum.

Step 5: Display sum

Step 6: Stop

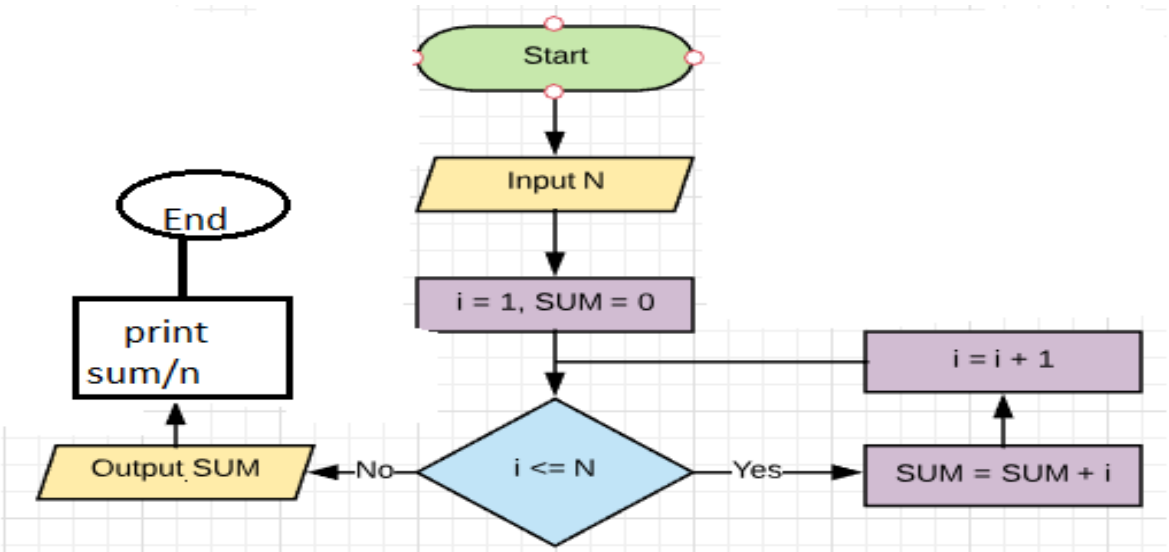
Long Answer type question

1) Explain flow chart and benefits of using the flow chart in programming. Draw a flow chart to find the sum and average of n integers.

(B.TECH-(SEM II) 2022-23, 2021-22)

Answer:- Flowchart is a graphical representation of an algorithm. Programmers often use it as a program-planning tool to solve a problem. It makes use of symbols which are connected among them to indicate the flow of information and processing.

Symbol	Name	Function
	Start/end	An oval represents a start or end point
	Arrows	A line is a connector that shows relationships between the representative shapes
	Input/Output	A parallelogram represents input or output
	Process	A rectagle represents a process
	Decision	A diamond indicates a decision



2) Discuss various storage classes used in C including the details of storage place, default value, scope and lifetime.

(B.TECH-(SEM II) 2022-23, 2021-22, 2020-21, 2019-20)

Answer:-

A variable name identifies some physical location within the computer where the string of bits representing the variable's value is stored. There are basically two kinds of locations in a computer where such a value may be kept— Memory and CPU registers. Moreover, a variable's storage class tells us:

(a) Where the variable would be stored.

(b) What will be the initial value of the variable, if initial value is not specifically assigned.(i.e. the default initial value).

(c) What is the scope of the variable; i.e. in which functions the value of the variable would be available.

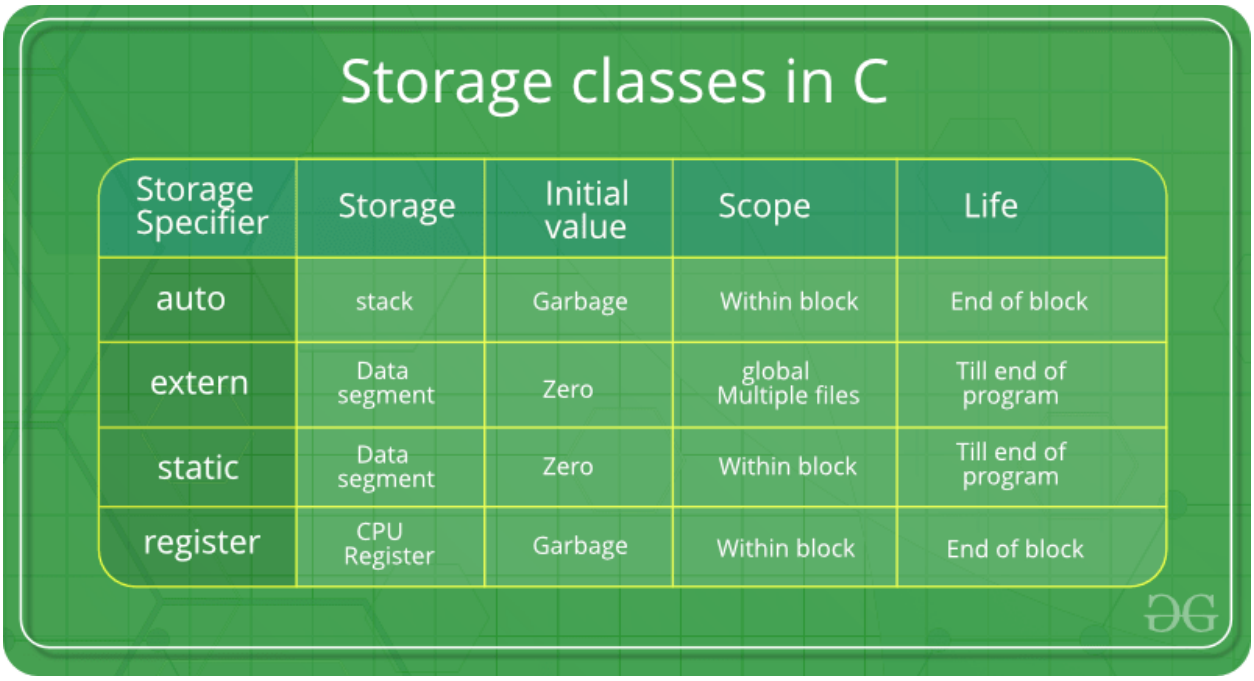
(d) What is the life of the variable; i.e. how long would the variable exist.

1. Automatic Storage Class-it is local variable known only to the function in which it is declared. (default is auto).

2. Register Storage Class- local variable which is stored in the register.

3. Static Storage Class- local variable which exists and retains its value even after the control is transferred to calling function.

4. External Storage Class- global variable known to all function in the file.



Automatic Variable

```
void main( )
{
auto int i = 1 ;
{
auto int i = 3 ;
printf ( "\n%d ", i ) ;
}
printf ( "%d", i ) ;
}
}
```

The output of the above program is: 31

External Variable

```
int i ;
void main( )
{
printf ( "\ni = %d", i ) ;
```

Static Variable

```
void main( )
{
 increment( ) ;
increment( ) ;
increment( ) ;
}

increment( )
{
static int i = 1 ;
 printf ( "%d\n", i ) ;
i=i+1;
}
```

Output:123

Register Variable

```
void main( )
{
register int i ;
```

```
increment( ) ;
increment( ) ;
decrement( ) ;
decrement( ) ;
}
increment( )
{
i = i + 1 ;
printf ( "\non incrementing i = %d", i ) ;
}
decrement( )
{
i = i - 1 ;
printf ( "\non decrementing i = %d", i ) ;
}
```

```
for ( i = 1 ; i <= 10 ; i++ )
printf ( "\n%d", i ) ;
}
```

The output would be:

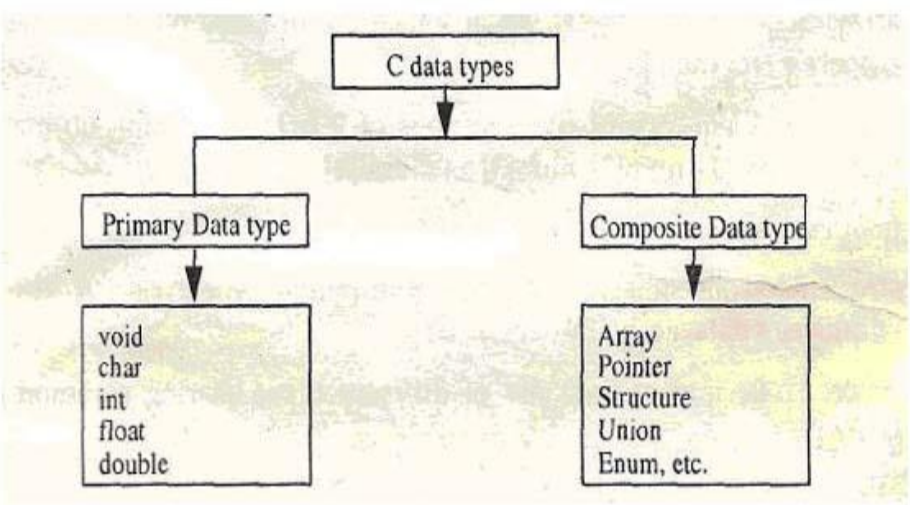
```
i = 0
on incrementing i = 1
on incrementing i = 2
on decrementing i = 1
on decrementing i = 0
```

3) Discuss various primitive data types used in C with suitable examples including their required memory size, format specifier and range.

(B.TECH-(SEM II) 2022-23, 2021-22, 2019-20)

Answer:- C language is rich in its data types. C supports following classes of data types.

1. Primary/Fundamental data types
2. Derived data types/composite data types



All c compiler support five fundamental data types, namely integer (int), character (char), floating point (float), double-precision floating point (double) and void.

1. **Integer types:** integers are whole numbers with a range of values supported by a particular machine. The size of an integer that can be stored depends on the computer. if we use a 16 bit word length , the size of an integer value is limited to the range -32768 to +32767 (-2^{15} to $2^{15}-1$).

2. **Floating point types:** Floating point numbers are stored in 32 bits, with 6 digits of precision. Floating point numbers are defined in c by the keyword float .when the accuracy provided by a float number is not sufficient; the type double can be used to define the number.

3. **Double – precision floating point:** A double data type number uses 64 bits giving a precision of 14 digits. These are known as double precision numbers. Remember that **double** type represents the same data type that float represents, but with greater precision. To extend the precision further, we may use long double which which uses 80 bits.

4. **Character types:** A single character can be defined as character (char) type data. Characters are usually stored in 8 bits (one byte) of internal storage. The qualifier signed or unsigned may be explicitly applied to char. While unsigned chars have values between 0 to 255, signed chars have values from -128 to 127.

5. **Void types:** the void type has no values. This is usually used to specify the type of functions. The type of a function is said to be void when it does not return any value to the calling function.

Size and range of data types

Data types	**Range**	**Bytes**	**format**

Signed char	-128 to 127	1	%c
Unsigned char	0 to 255	1	%c
Short signed int	-32768 to32767	2	%hd
Short unsigned int	0 to 65535	2	%hu
signed int	-32768 to32767	2	%d
unsigned int	0 to 65535	2	%u
long signed int	-2147483648 to +2147483648	4	%ld
long unsigned int	0 to 4294967295	4	%lu
float	-3.4E38 to +3.4E38	4	%f
double	-1.7E308 to +1.7E308	8	%lf
long double	-1.7E4932 to +1.7E4932	10	%Lf

4) State desirable characteristics of an algorithm. Write an algorithm to calculate sum of digits of a number entered by user.

(B.TECH-(SEM I) 2022-23)

Answer:- **Algorithm**:-An algorithm is a complete, detailed, and precise step by step method for solving a problem independently of the software and hardware of the computer.

Characteristic of an algorithm: there are five important characteristic of an algorithm

- **Input**- it may accept zero or more input
- **Output-** it should produce at least one output.
- **Definiteness-** each instruction must be clear, well defined and precise. there should not be any ambiguity.
- **Finiteness -**it should be a sequence of finite instructions.
- **Effectiveness-** operation must be simple and carried out in a finite time at one or more levels of complexity.

Example:--

Step 1: START

Step 2: Read three number x, y, z.

Step 3: If x>y

a) If x>z then x is greatest number

b) Else z is greatest number

Step 4: else

a) If y>z then y is greatest number

b) Else z is greatest number

Step 5: Stop

Algorithm to calculate sum of digits of a number entered by user:-

- Step 1: start
- Step 2: Get number by user
- Step 3: Get the modulus/remainder of the number
- Step 4: sum the remainder of the number
- Step 5: Divide the number by 10
- Step 6: Repeat the step 2 while number is greater than 0.
- Step 7: stop

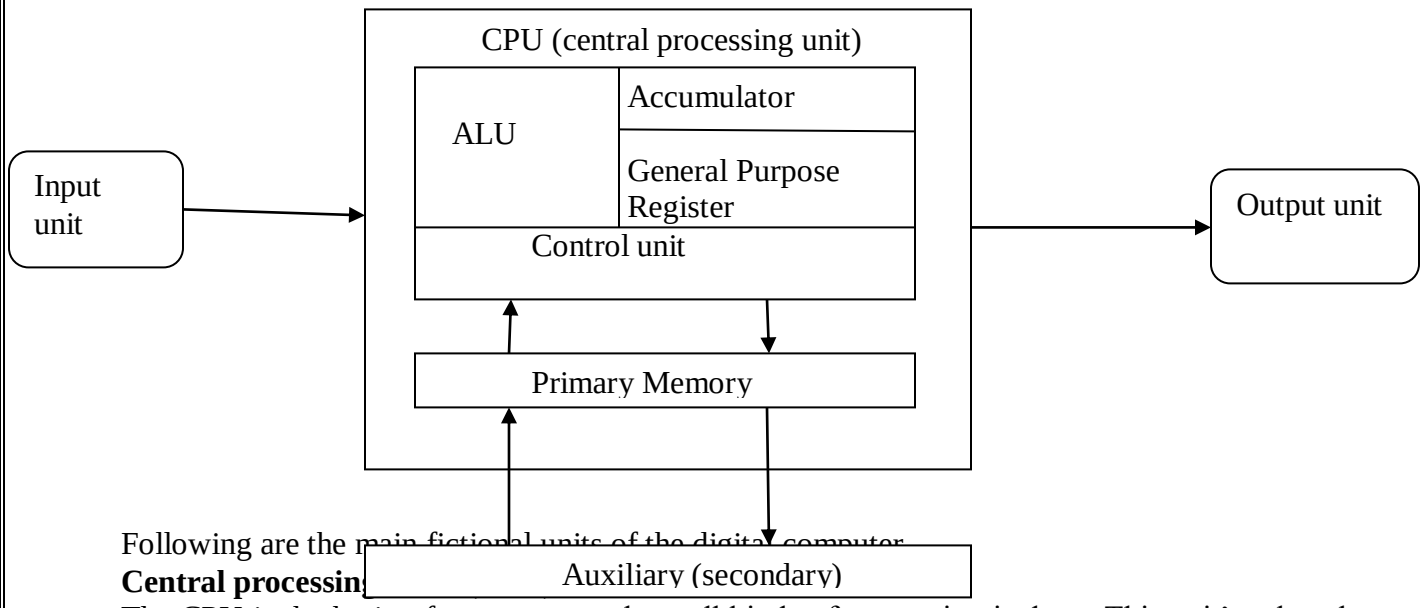
5) Illustrate basic components of computer system with neat block diagram.

(B.TECH-(SEM I) 2022-23, 2021-22, 2019-20)

Answer:- A digital computer is a programmable machine which reads binary instruction and process the data which are presented in binary form.

The digital computer takes the binary data as an input processes according to the set of instructions called programs and produces the digital output. The computer which we commonly used today are digital.

A digital computer may be represented by the following schematic diagram:



Following are the main fictional units of the digital computer

Central processing

The CPU is the brain of a computer where all kinds of processing is done. This unit's takes the input data from the input devices and processes it according to the set of instruction called program. The output of the processing data is directed to the output devices for the use in the outside world.

The major function of the CPU is to store the data temporarily in the register and perform arithmetic &logical computation. This unit also controls the operation of all other functional units of the computer such as input & output devices.
CPU has four major parts called:

- **ALU (Arithmetic Logical Unit):** The function of an ALU is to perform arithmetic and logical operation such as addition, subtractions,, multiplication and division, AND,OR,NOT,XOR operation. It also perform increment, decrement, left shift, clear and any others operations.
- **Accumulator:** CPU also contains a set of register called accumulator. A register may be thought of as a unit capable of storing eight or more bits. The one byte register is capable of storing one byte (8 bits) at a time. Each bit is stored in a device called flip-flop. Flip flop are the electronic circuit capable of storing a bit temporarily.
- **General purpose Register:** It is also called programmable register. These register are at the disposal of the programmer and he may write a program to use them according his needs in order to execute the program.
- **Control Unit:** The control unit is the most important part of the CPU as it control and co-ordinates the activities of all other units such as ALU, memory unit & output unit. The control unit (cu) acts as the nervous system. All the related function for program execution such as memory read , I/O write, execution of instruction are synchronized through the control signal generated by the CPU.

Memory: Memory is also known by term storage and its function is store coded form of information from the human operator through input devices.
Similarly, the result produced by the computer after processing must be kept somewhere before they are passed on to the output unit for display. Moreover, the intermediate results produced by the computer must also be preserved.
Primary / Main Memory: The primary / main memory of the computer provides, supports for these storage function. The main memory is a fast memory. it stores program along with data the main memory is directly accessed by the CPU. The result produced by the computer after processing must be kept somewhere before they are passed on to the output unit for display. Moreover, the intermediate results produced by the computer must also be preserved.
The primary / main memory of the computer provides, supports for these storage function. The main memory is a fast memory. It stores program along with data the main memory is directly accessed by the CPU.
Cache Memory: In the system it has depend upon the main memory to supply the instruction and data as and when it needs. Because the CPU runs as much faster than the main memory system. It ends up waiting for information, which is inefficient to reduce this effect we have cache memory cache temporarily stores instruction & data that the processor is likely to use frequently. Thus cache speeds up processing.

RAM (Random Access Memory): RAM temporarily stores program instruction and data before and after it is processed by the CPU. RAM is said to be "Volatile- " - The contents are lost when the power goes off or is turned off. RAM is also referenced to as Read write Memory

ROM (Read only Memory): ROM is also a part of memory and it is also called non-volatile. As the name indicates, the ROM can be used only for reading or fetching of data from it . The data or program is written into ROM only once it has been written it cannot be modified or altered. The term "non- volatile" means that even if the power is switched off, the data or program stored in ROM is not destroyed. When the power comes, the same data appears once again. This is happen because of the permanent hardware pattern used to store the data in ROM.

One of the important usages of ROM is to store the Basic Input- Output Software (BIOS). This program is very important as it is used by the OS at the time of starting-up or booting the system. Since this program is used every time the computer is turned on, it must be stored in the ROM.

Input-unit: Input unit in the functional diagram of digital computer represents the various input device which are used to input the real world data in to the computer. The function of the Input-Unit is to accepts coded information from the human operator or from the electromechanically device or from other computer connected to it through an internet or by any other media. Input device converts the human data into the form which is acceptable by the digital computer.

E.g.: keyboard, mouse, scanner are the input devices

Output Unit: The output unit is used to represents the information processed by the digital computer. The function of the output unit is to store the processed information and display it as and when needed by the user. Cathode Ray Tube (CRT) terminals, printers and speakers are the example of the output devices.

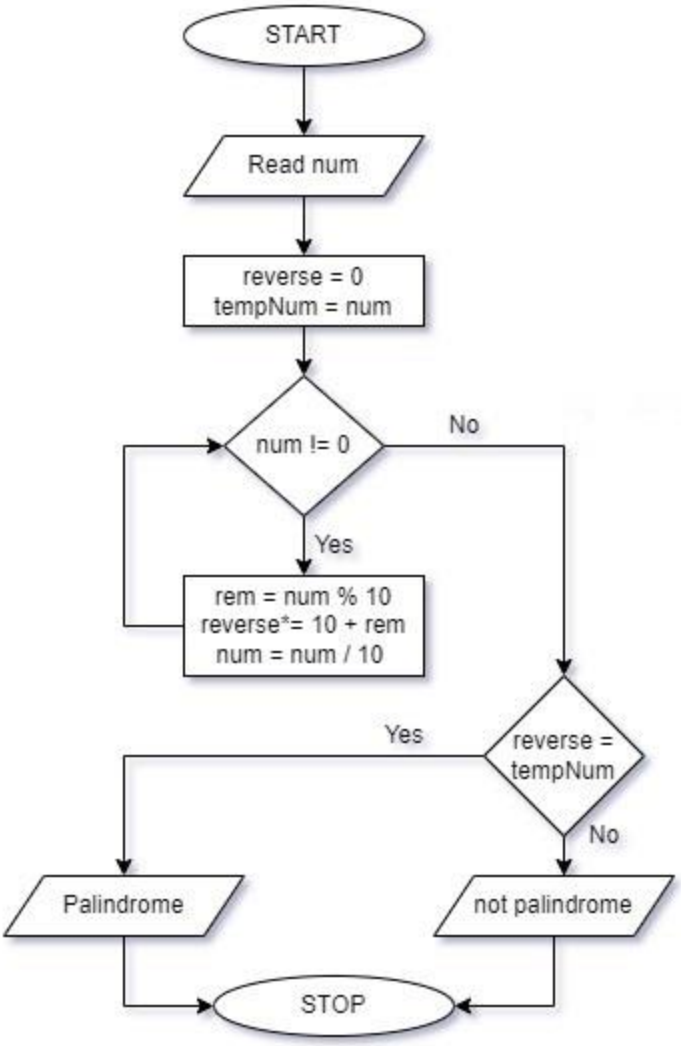
6) Write an algorithm and draw a flow chart to check whether the number entered by user is palindrome or not.

(B.TECH-(SEM I) 2022-23)

Answer:- Algorithm:-

1) Start
2) Get the number from user
3) Hold the number in temporary variable
4) Reverse the number
5) Compare the temporary number with reversed number
6) If both numbers are same, print palindrome number
7) Else print not palindrome number
8) Stop

Flow Chart:-



7) Define flowchart and draw a flowchart to find largest among three Numbers.

(B.TECH-(SEM I) 2021-22)

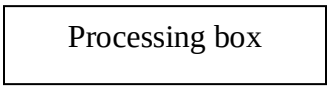
Answer:-

Flowchart- when step by step solution of a given problem is illustrated in the form of graphical chart that chart is called flowchart.

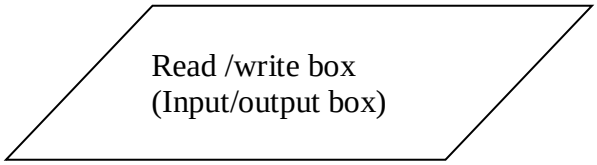
Symbols of flow chart:

Terminal box- this symbol is used to represent starting and stopping of a program.

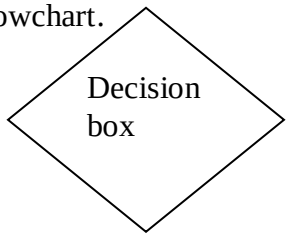
Processing box- All arithmetic process such as addition, multiplication, division, subtraction are depict in processing box. It is denoted by rectangle.



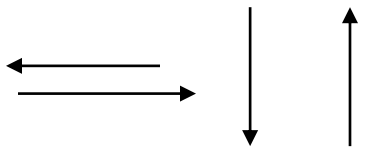
Read / write box- A parallelogram is used to depict the reading /writing process.

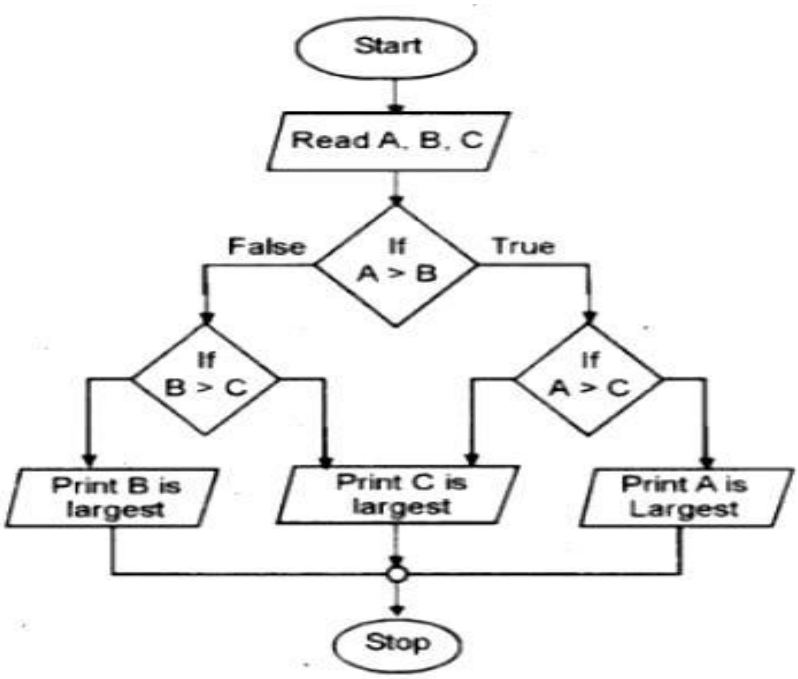


Decision box- A diamond symbol is used for depicting comparison of two values or condition checking or decision making in flowchart.



Flow line- a flow line is a simple line with an arrow at its front end. The head of arrow depicts the direction of flow.

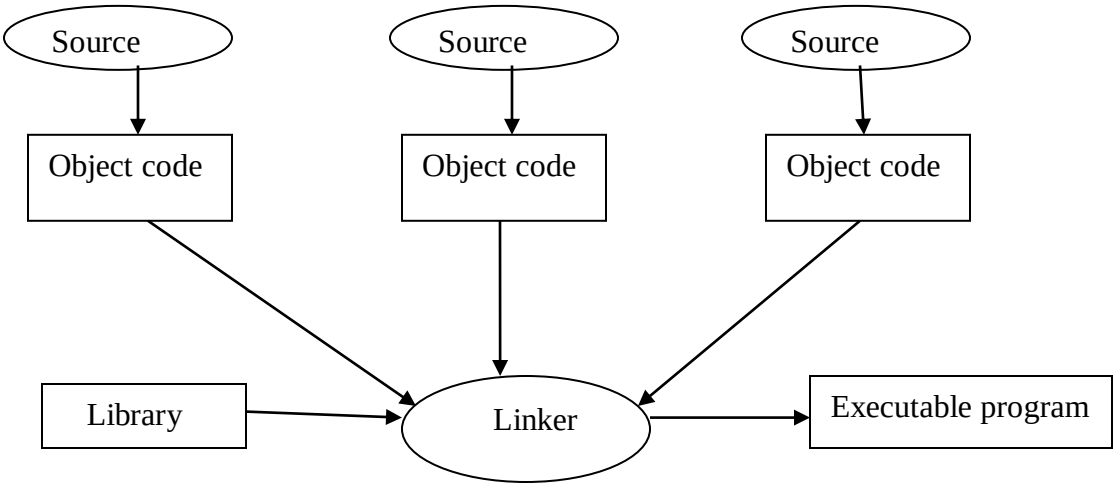




8) Write the short notes on (i) Compiler (ii) Interpreter (iii) Linker (iv) Loader

(B.TECH-(SEM I) 2020-21, 2019-20)

Answer:- Compiler: A program that translate source code in to object code. The compiler derives its names from the way it works, it looking at the entire piece of source code, collecting and rearranging the instruction. It also checks that t he program is grammatically correct.

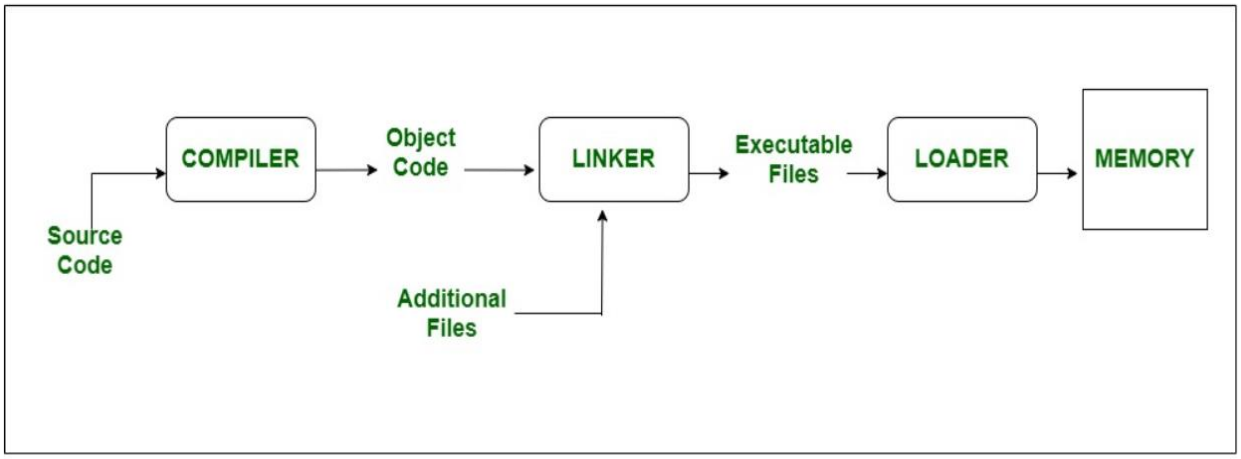


Interpreter:

It also a program that translates a high level language in to low level one. But it does it at the moment the program is run. It takes the program, one line at a time and translates each line before running it. The interpreter has no memory for the translated lines, so if it comes across lines of the program within a loop, it must translate them every time that particular line runs.

Linker: A linker is special program that combines the object files, generated by compiler/assembler and other pieces of code to originate an executable file have .exe extension. In the object file, linkers searches and append all libraries needed for execution of file. It regulates the memory space that will hold the code from each module. It also merges two or more separate object programs and establishes link among them.

Loader: It is special program that takes input of executable files from linker, loads it to main memory, and prepares this code for execution by computer. Loader allocates memory space to program. Even it settles down symbolic reference between objects. It is in charge of loading programs and libraries in operating system. The embedded computer systems don't have loaders.


COMPILER
Object Code
LINKER
Executable Files
LOADER
MEMORY
Source Code
Additional Files