

B. Tech I Year [Subject Name: Programming for Prob. Sol.]

Subject Name: Programming for Problem Solving

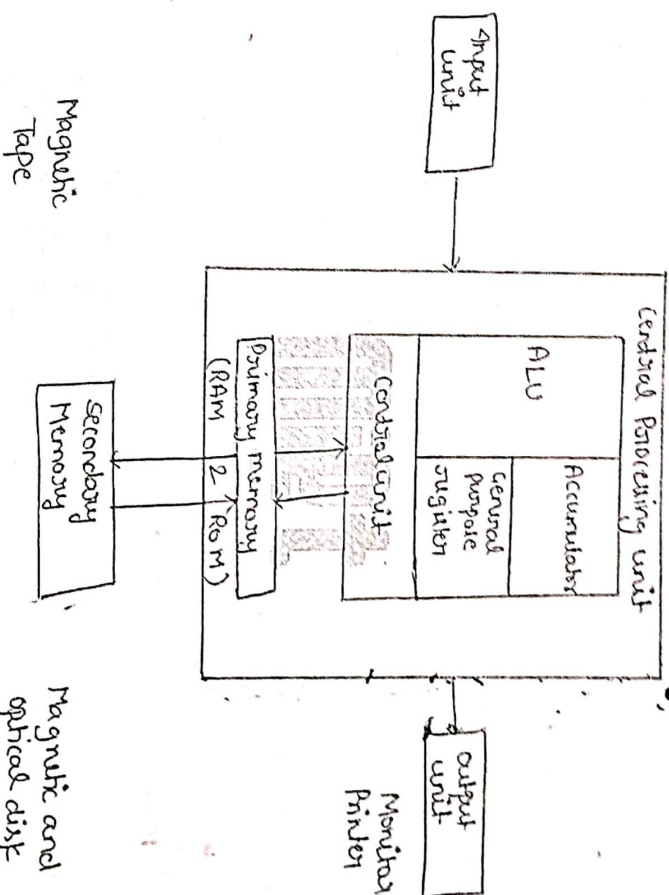
Unit No.	Unit Name	Syllabus Topics	Lecture No
1	Introduction to Programming: Introduction to components of a computer system:	Memory, processor, I/O Devices, storage	1
		Operating system and it's type	2
		Introduction to low level & high level languages	3
		IDE role for development, Concept of assembler, compiler, Interpreter, loader and linker	4
	Idea of Algorithm:	Representation of Algorithm, Flowchart	5
Programming Basics:		Pseudo code with examples	6
		Structure of C program: writing and executing the first C program, types of errors	7
		Components of C language: Standard I/O in C	8
		Fundamental data types, Variables and memory locations	9

mit

B. Tech I Year [Subject Name: Programming for Prob. Sol.]

Unit: 1

Ques: Discuss the major components of a digital computer with suitable block diagram. Also discuss the function of each component? (2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21)



Block diagram of digital computer

1) Input unit: It links the external environment with the computer system.

2) All input device must transform the input data into the binary codes, which the primary memory of computer is designed to accept.

The commonly used input devices are keyboard, mouse etc.

2) Storage Unit: The storage unit of a computer holds data and instructions that are entered through the input unit, before they are processed.

It stores programs, data as well as intermediate results and results for output. Its main function is to store information.

(a) Primary Storage (Main memory): The memory is generally used to hold the program being currently executed in the computer, the data being received from input device, the intermediate and final result of a program.

The primary memory is temporarily in nature. The data is lost when the computer is switched off.

(b) Secondary storage (Auxiliary Memory): It is a mass storage

device. It is non-volatile in nature i.e. data is not lost even if the power supply is switched off. Some of the most commonly used secondary storage devices are Hard disk, pen drive etc. Their access time is in milliseconds.

(c) Cache memory (High speed buffer): It is a high speed, expensive memory unit which is placed between the processor & primary memory, to reduce the mismatch between the speeds of two units.

3) Central Processing Unit (CPU): The control unit and arithmetic logic unit of computer are together known as central processing unit (CPU). The CPU is like brain and performs following function. It performs all calculations, it takes all decisions, and it controls all unit of a computer.

(a) Control unit: It manages and coordinates the entire computer system and synchronizes its working thus referred to as "central Nervous system" or "brain of the computer".

(b) Arithmetic and logic unit: The function of an arithmetic logic unit is to perform arithmetic and logical operations such as addition, subtraction, multiplication, division, AND, OR, NOT, exclusive OR etc.

4) Output unit: It performs the reverse operation of that of an input unit, so it supplies information obtained from processing to outside world.

Ques 2 Explain the basic organization of a computer. (2016-17)

Ans organization of digital computer: Computer system are used for some basic operations and converting raw input data into information which is useful for users.

(1) Inputting: process to enter data and instruction into the computer system

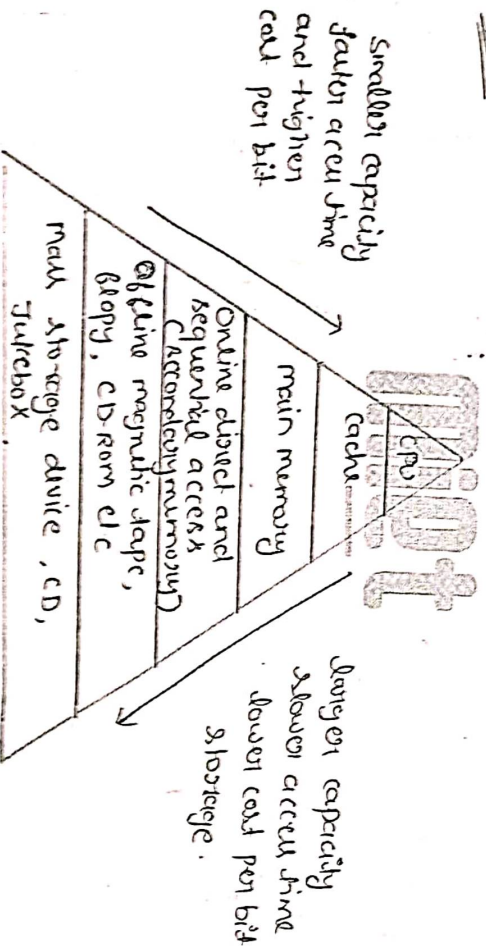
2) Storing: Saving data and instruction to make them readily available for initial or additional processing.

3) Outputting: Process of producing useful information or results for the user, such as printed report.

4) Controlling: Directing the manner and sequence in which all of the above operations are performed.

Ques 3 Draw the memory hierarchical structure of a computer system.

Ans



- o Cache
 - o CPU (central processing unit)
 - o CU (control unit)
 - o ALU (Arithmetic and Logic unit)
- Note: - Paybold draw.
for theory speed question no. 1

Ques 4 what is digital computer? Draw a block diagram of it and explain ALU and CU role. (2016-17, 2015-16)

Ans Paybold question no 1: (digital computer)

Ques 5 Differentiate between RAM and ROM. (2015-16)

Ans

Difference	RAM	ROM
1. Data Retention	RAM is a volatile memory which could store the data as long as the power is supplied.	ROM is a non-volatile memory which could retain the data even when power is turned off.
2. Working type	Data stored in RAM can be retrieved and altered.	Data stored in ROM can only be read.
3. Use	Used to store the data that has to be currently processed by CPU temporarily.	It stores the instruction required during bootstrap of the computer.
4. Speed	High speed memory	Slower than RAM
5. CPU interaction	The CPU can access the data stored on it.	The CPU cannot access the data stored on it unless the data is stored in RAM.
6. Size & capacity	Large size with higher capacity	Small size with less capacity.
7. Used as in	CPU cache, primary memory	Firmware, microcontroller.

8. Accessibility	The data stored is easily accessible	The data stored is not as easily accessible as in RAM.
9. cost	Cashier	Cheaper than RAM

Ques Brief the generations of the programming language with example. (2017-18, 2020-21)

Differentiate between low level language and high level language.

Ans Low level languages

Advantage

- They are faster than high level language
- Low level language are memory efficient.
- No need of translator except assembler for AL.
- Low level language are difficult to learn.
- They are machine dependent and are not portable.

High level languages

Disadvantage

- They are comparatively slower
- High level language are not memory efficient.
- Compiler & interpreter is needed to convert HLL.
- High level language are easy to learn.
- They are machine independent and portable.

They are more error prone.	They are less error prone
Debugging and maintenance is difficult.	Debugging and maintenance is comparatively easier
Ex: machine & assembly language	Ex: C, C++, Java

Ques 7. What is operating system? what are the various component of operating system. Describe the functionalities of operating system? (2015-16, 2018-19)

Ans An operating system (OS) is a system program which provides an interface between user and hardware.

Ex: - UNIX, LINUX, windows etc.

Ques Justify that operating system is a resource manager. An operating system is termed as resource manager on resource allocation, as it provides all necessary resources (Hardware, Software on Files) to application execution inside a computer system, like to play a song, OS allocates operational mode, monitor, speaker, scan, hard disk, buses, processor etc to application.

Component of OS:-

① Process management: Creating and deleting both user and system process.

- Scheduling and managing process.
- Mechanism for process synchronization.
- Provide mechanism for process communication & deadlock handling.

- ② Main Memory management:
 - keep track of which part of memory are currently being used and by whom.
 - Deciding which process are to be loaded into memory when memory space become available.
 - Allocating and deallocating memory.
 - ③ Secondary Memory management:
 - Allocation & deallocation of memory
 - keep track of disk address i.e. no. of surface track & sector.
 - ④ Input / output management:
 - It includes buffering, caching & spooling.
 - It also control device driver interface.
 - ⑤ File management:
 - creating & deleting files and directories.
 - mapping files and backup files.
- Service of OS / Function of OS
- ① Program Execution: The system is able to load a program into memory & to run that program.
 - ② Input / output operation: A running program require input and output through a file input device.

- ③ File system Manipulation: To create and delete files or to read and write on to files.
 - ④ Resource Allocation: when multiple users are logged on to system or multiple jobs are running the same time, resource may be allocated to each of them.
 - ⑤ Protection: It involves ensuring that all access to system resource is controlled.
 - ⑥ Accounting: To keep track of which user how many and which kind of computer resources.
- Ques: Why operating system is required? what are the types / classification of operating system? (2015-16)
- Ans: Need of OS:
 - manage the computer resources such as the CPU, memory, disk drive and printer.
 - Establish a user interface.
 - Execute and provide services for application software.
- Classification of OS:
- ① Batch OS: To speed up processing operations both together jobs with similar needs and run them through the computer as a group.
 - ② multi programming OS: The OS switch to and execute other job when job needs to wait & run to return back when job gets resource so CPU is never idle.

③ Time sharing OS: It is also known as multitasking. The CPU executes multiple jobs of various users by switching among them, but switch occurs so frequently, that the user can interact with each program.

④ Multiprocessor OS: It is parallel and tightly coupled system in close communication with each other share the computer bus, clock, memory & peripheral devices, they are symmetric or asymmetric.

⑤ Distributed OS:
 a) Loosely coupled system.
 b) In these two or more systems are working together but no sharing of system clock, bus and memory is required.

⑥ Real time OS: It is used when rigid time is required for any operation to take place.

They are classified as hard and soft real time OS.

⑦ List five internal and external commands used in DOS operating system.

Internal commands:

1) Dir: Display the list of existing files on a disk.

2) CLS: Clear screen.

3) MD / MKDIR - To create a directory.

④ cd: To change the current directory from the root.

⑤ rd: To remove empty directory.

External commands:

1) Format: This command will create track & sectors on a disk.

2) Attrib: It changes or display the attributes of a file.

3) Android: It is a powerful operating system supporting a large no. of application in smart phones.

4) EDIT: This is used to modify or change the data of a file.

5) LABEL: It is used to create, change, delete the volume label of a disk.

Ques Give difference between android and windows OS. (2015-16) (old/rev)

Basis	Android	windows
1) <u>Graphics</u>	Relatively optimized	Full fledged
2) <u>Source code</u>	open source code	close source code
3) <u>security</u>	comparatively less	slightly more
4) <u>Application</u>	Ahead for mobile	known for PC
5) <u>Developer</u>	Google	Microsoft

Ques II What is algorithm? write the characteristics of an algorithm?

Ans A step by step method of solving a problem or making decisions is termed as algorithm.

Characteristics of algorithm:

- ① Input: Zero or more inputs i.e. quantities which are given to it initially before the algorithm begins.
- ② Output: An algorithm has one or more outputs i.e. quantities which have a specified relation to the inputs.
- ③ Finiteness: An algorithm must always terminate after a finite number of steps.
- ④ Definiteness: Each step of an algorithm must be precisely defined, the action to be carried out must be rigorously and unambiguously specified for each case.
- ⑤ Effectiveness: An algorithm is also generally expected to be effective. This means that all of the operations to be performed in the algorithm must be sufficiently basic that they can in principle be done exactly and in a finite length of time.

Ques II What is flowchart? Draw a flowchart to find maximum of three numbers and sum and average of three numbers also. (2014-17, 2015-16)

Ans It is a pictorial representation of the sequence of operations

necessary to solve a problem with a computer. It is given by John Von Neuman 1945.

Flowchart (i) to find maximum of three numbers
algorithm: ① Start

② Read the three numbers to be compared as A, B & C.
③ Check if A is greater than B.

3(i) If true, then check if A is greater than C.

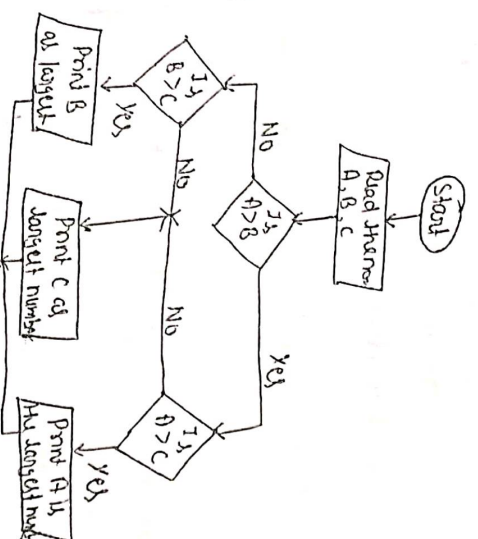
3(ii) If true, Print A as greatest number

3(iii) If false, Print C as greatest number

3(iv) If true, Print B as the greatest number.

3(v) If false print C as the greatest number.

Flowchart

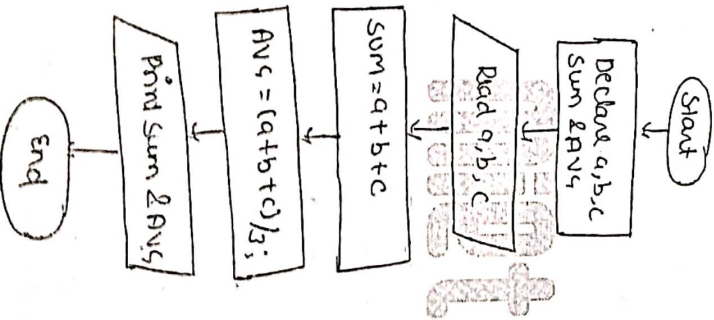


(ii) To find sum and average of three numbers.

Algorithm ① Start

- ② Read the three numbers suppose a, b, c from user
- ③ Declare a variable "sum" & "Avg"
- ④ $sum = a + b + c$
- ⑤ $Avg = sum / 3$
- ⑥ Display "sum" and "Avg"
- ⑦ End

Flowchart

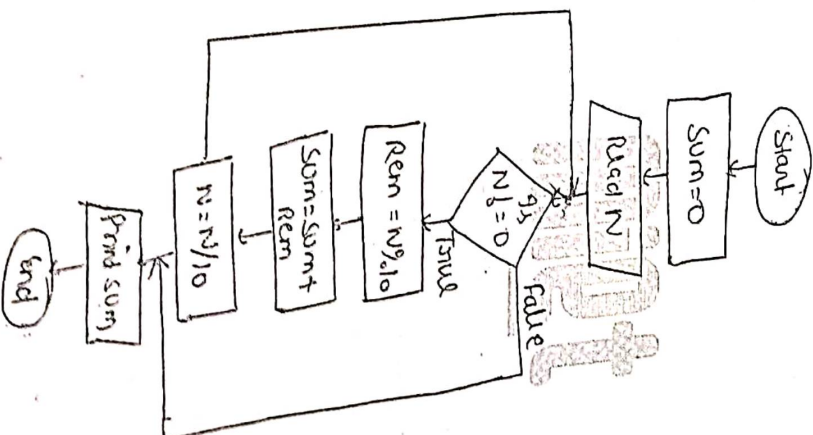


(iii) To find sum of digit of an integer number.

Algorithm ① Input N

- ② $sum = 0$
- ③ while ($N \neq 0$)
 - $Rem = N \% 10$
 - $sum = sum + Rem$
 - $N = N / 10$
- ④ Print sum

Flowchart



(iv) To reverse an integer number entered by the user.

Algorithm: ① Ask the user to enter any number

② Declare and initialize another variable, reversed with 0, where reversed an integer variable, reversed with 0, where reversed an integer variable, reversed

③ Set the last digit of the given number by performing the modulo division (%) and store the value in last digit variable

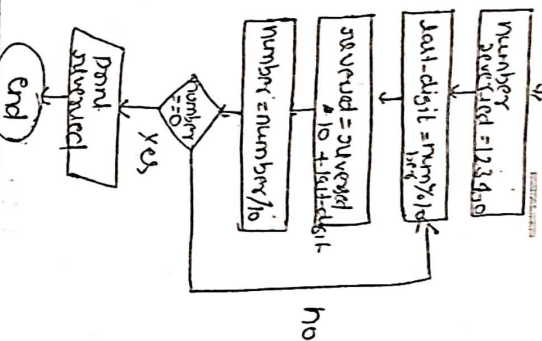
last-digit = number % 10

④ Reversed = Reversed * 10 + last-digit

⑤ number = number / 10

⑥ Repeat the steps 3 to 5 till number is not equal to 0 (or greater than zero).

Flowchart:



Ques 13 Difference (i) Algorithm & Flowchart

(ii) Pseudo code and Flowchart

Difference		Algorithm	Flowchart
Basic		An algorithm is a step by step method for solving some problem.	① It is graphical representation of an algorithm
Comprehensibility		Hard to understand	Easy to understand
Implementation		No rules, employed for algo.	Predefined rules
Symbols		No symbol, we plain text	Use of symbols ex: $\square$, ∇ , $\diamond$, $\circ$
Debugging		Easy to debug	Hard to debug
Nature		Programmer's pseudocode	Graphical representation of logic

(ii) Pseudo code

Flowchart

① An informal high level description of the operating principle of an algorithm

② A diagrammatic representation that illustrate a solution method to a given problem

③ written in natural language and mathematical notation help to write pseudo code.

④ written using various symbols.

Ques 1 Difference between compiler and interpreter?

(iii) Linkers and loader

Basics	Compiler	Interpreter
Definition	It scans the entire program and translates it into machine code (as whole)	Translates program one statement at a time (line by line)
Error display	Display the syntax error as a whole	Display the syntax error line by line
Execution time	The overall execution time is faster	The overall execution time is slower
Debugging	Debugging is hard	Debugging is easy
• Exe file	• Exe file is created using compiler	• Exe file is not created using interpreter
Example	Programming language like C, C++ uses compiler (Turbo C, GCC)	Programming language like Python, Java uses interpreter

(ii) Linker & loader

Basics	Linker	Loader
Basic	It generates the executable module of a source program	It loads the executable module to the main memory
Input	It takes as input, the objects generated by an assembler	It takes executable module generated by a linker

Ques 15 why C programming is called structured programming?

Function	Type / Approach	
It combines all the object modules of a source code to generate an executable module.	Linkage editor, Dynamic linker	It allocates the address to an executable module in main memory for execution.
		Absolute loading, Relocatable loading and dynamic run-time loading.

Ans: ① It solve a large problem.
② It can divide the problem into smaller structured blocks each of which handles a particular sub-problem.

- ③ Decision making blocks like if, else, else if etc.
- ④ Repetitive blocks like while, for, do-while etc.

Ques Write a note on top-down program development approach?

Ans: ① It is a design approach where a large task is divided into no. of sub independent task to reduce complexity.

② Here each subtask is solved separately & solutions of each are combined to provide complete results.

Ques 17 Explain basic structure of C program?

Ans Documentation (Documentation section)

o Preprocessor statements (Link section)

o Global declarations (Definition)

o The main() function

o Local declaration

o Program statement and expression

o User defined function

#include <stdio.h>

int main()

```
{
    printf("Hello");
    return 0;
}
```

Ques 18 While compiling the code write the name of two syntax and two logical errors?

Ans o A missing semicolon(';') at the end of a line or an extra bracket at the end of function, may cause a syntax error.

o Logical error is a bug or mistake in source code that result is incorrect.

Ques 19 How binary file differ from text file?

Ans A text file stores data in the form of alphabets, digits and other special symbols by showing their ASCII value and are in human readable format.

o A binary file contains a sequence or a collection of bytes which are not in a human readable format.

Ques 20 Define the following term with one example - (2015-16)

(i) Editor

(ii) Procedural programming

Ans Editor: It is a program much like a word processor that is used to write or edit the source code of any program on computer system.

Ex: 1. Notepad, Netbeans IDE

Procedural programming: It is a type of language that specifies a series of well structured steps or procedure with-in its programming context to compile a program.

o Here the main focus is on procedure & it contains a systematic order of statement to complete a task.

Ques 21 A program has been compiled and linked successfully. When you run this program you face one or more of the following situation -

(i) Program executed, but no output

(ii) It produce incorrect answers

(iii) It does not stop running

Explain all above condition in detail.

Ans (i) This usually happens due to run time error in the program like referencing an out of range array element or mismatch of data type.

(ii) At places increased curly then there may be logical error in the program like failure to consider a particular condition or incorrect translation of the algorithm into the program or incorrect order of evaluation of statements etc.

(iii) This happens when we make use of curly syntax statement but incorrect logic like if (code = 1) count++;

Instead of using comparison operators we are using assignment which is syntactically correct & count++ is always executed resulting in infinite loop.

Ques 22 why do curly braces denote in C? (2015-16, 2016-17)

Ans if } two curly braces are used to group all the statements.

Ques 23 what do you understand by standard I/O in C language?

or

explain some formatted and unformatted I/O in C language?

Standard I/O in C language

Input
 (i) when we say Input, it means to feed some data into a program.

(ii) An input can be given in the form of a file or from the command line.

(iii) C programming provides a set of built in functions to read the given input and feed it to the program as per requirement.

⇒ output: it means to display some data on screen, printer, or in any file.

(iv) C programming provides a set of built in functions to output the data on the computer screen as well as to save it in text or binary files.

Some I/O :

- ① scanf() & printf()
- ② stdin & stdout
- ③ gets() & puts()
- ④ getchar() & putchar()

Ques what is special about void pointer?

Ans (i) A void pointer is a pointer that has no associated data type with it.

(ii) A void pointer can hold address of any type and can be typecast to any type.

Ques 12 Difference between

#include <stdio.h> and #include "stdio.h"

① When enclosed header file in " " (quotes) then compiler first checks it in current directory where the command is being issued.
ex: i.e. TC

② When enclosed header file in < > then it search in standard directories where usually header file reside.

ex: C\TC\bin\TC

Ques 13 What is the difference between .obj and .exe file?

Ans: An object file is a file generated after compiling the source code.

① While an executable file is a file generated after linking a set of object files together using a linker.

Ques 14 Difference between intmain() and voidmain()?

Ans: The void main() indicates that the main() function will not return any value, but the intmain() indicates that the main() can return integer type value.

Ques 15 What is getch() and putchar()?

Ans: putchar() function is a file handling function, which is used to write a character on standard output screen.

② getch() is used to get/read a character from keyboard input.

Ques 16 What is the use of gets and puts in C?

Ans: The puts() function is used to print the string on the console which is previously read by using gets() or scanf() function.

② gets() is a function that read a string from standard input.

Ques 17 What do you mean by formatted input/output and unformatted input/output in C language? Explain with examples.

Ans: Input/output built in function in C falls into two categories - formatted I/O function

- unformatted I/O function.

① printf() and scanf() are formatted I/O
② getch(), getche(), getch(), puts(),
putchar(), etc are unformatted I/O

scanf() and printf(): The standard I/O header file named

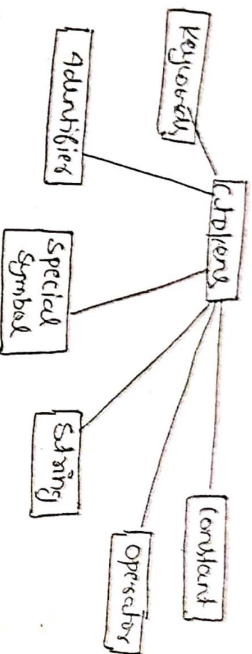
stdio.h contain the definition of

the function printf() and scanf() which are used to display output on screen and to take input from user respectively.

unformatted I/O: Defined in previous questions

↳ gets() & puts()
↳ getch() & putchar()

Ques Define tokens, in "C" language? (2017-18)
Ans. Smallest unit in program.



① Keywords: whose meaning is already defined in library.

② Identifiers: known as variable, there are three entity during of execution of program.

③ Operator: whose meaning is already known to a C compiler. There are total 45 operators used in C language like +, -, &, ++

④ String: It is the collection of characters, digit or special symbol enclosed in double quotes.

Ex: Void main()

```

{
  int r;
  float a, c;
  char c1;
  printf("Enter radius");
  scanf("%d", &r);
  a = 3.14 * r * r;
  c = 2 * 3.14 * r;
  printf("Area = %.f", a);
  getch();
}
  
```

Ques Define data type in C. Discuss its formal, memory size, format specifier and range. What is enumerated data type? (2015-16, 2016-17, 2020-21)

Ans. Data type is used to declare the variable. As different the type of value and the range of value that can be stored inside a variable.

Data type	Format Specifier	Size	Range
char	%c	1 byte	-128 to 127
signed int	%d	2 byte	-32768 to 32767
signed short int	%d	1 byte	-128 to 127
signed long int	%ld	4 byte	-2,147,483,648 to 2,147,483,647
unsigned int	%u	2 byte	0 to 65,535
unsigned short int	%u	1 byte	0 to 255
unsigned long int	%lu	4 byte	0 to 4,294,967,295
float	%f	4 byte	3.4E-38 to 3.4E+38
double	%lf	8 byte	1.7E-308 to 1.7E+308
long double	%Lf	10 byte	3.4E-4932 to 1.1E+4932

⑤ Enumerated data type is a user defined data type it is mainly used to assign names to integral constants, the names make a program easy to read and maintain.