

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

Subject Name	Programming for Problem Solving
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Unit No.	Unit Name	Syllabus Topics	Lecture No
	Introduction to Programming:	Memory, processor, I/O Devices, storage	1
	Introduction to components of a computer system:	Operating system and its type	2
	Idea of Algorithm:	Introduction to low level & high level languages	3
1	Programming Basics:	IDE role for development, Concept of assembler, compiler, Interpreter, loader and linker	4
		Representation of Algorithm, Flowchart	5
		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

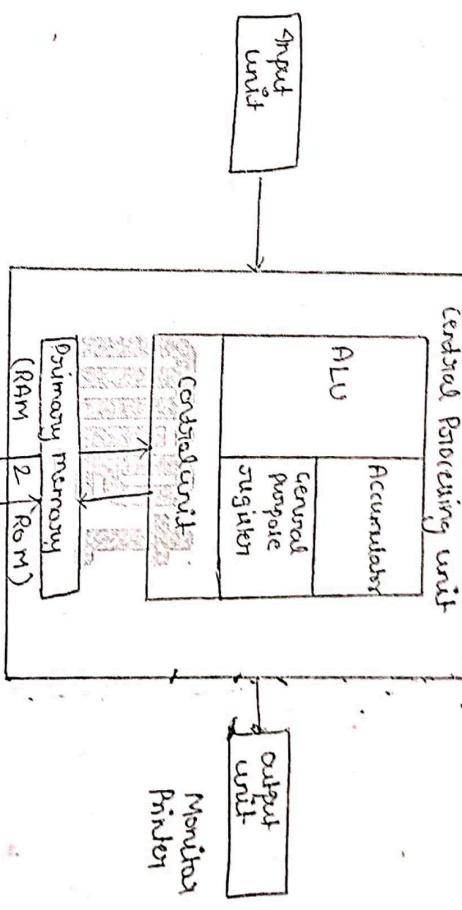
QUESTION

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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)

Ans



Magnetic  
Tape

Magnetic and  
optical disk

Block diagram of digitized 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:  
 (i) The storage unit of a computer holds data and instructions that are entered through the input unit, before they processed.  
 (ii) It stores programs, data as well as intermediate results and results from output, its main function is to store information.

(iii) Primary Storage (Main memory): The memory is generally

being currently executed in the computer, the data being received from input device, the intermediate and final result of a program.

(iv) The primary memory is temporary in nature. The data is lost when the computer is switched off.

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

memory slower but cheaper. 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 perform 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: Explain the basic organization of a computer. (2016-17)  
Ans: Explain the basic organization of a computer. Computer system are organized as digital computer. Computer system are used for some basic operations and converting raw input data into information which is useful for work.

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

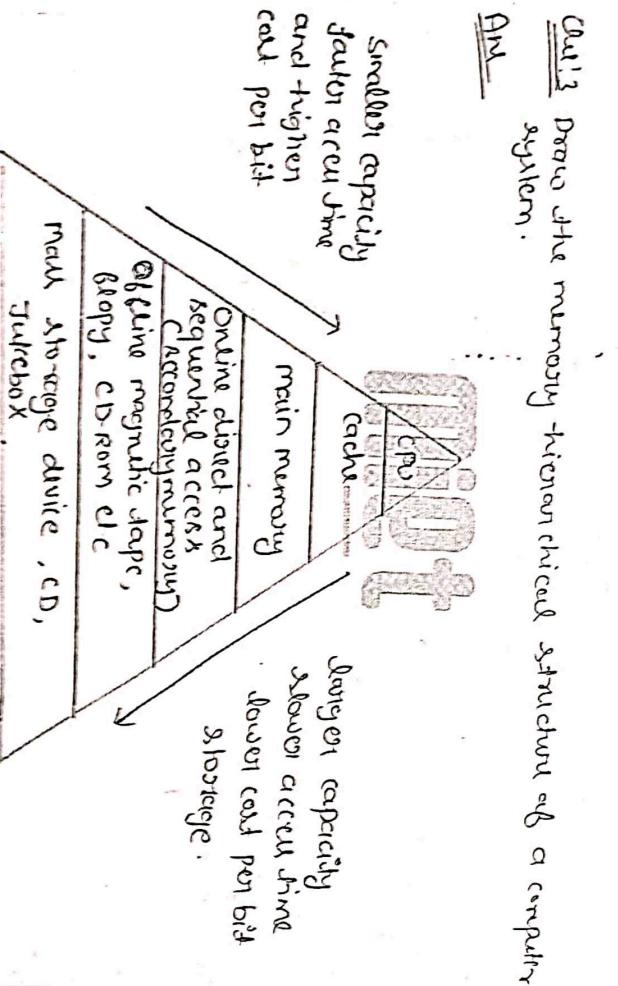
2) Storing: ◊ Saving data and instruction to make them steadily available for internal or additional processing.

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 hierarchy structure of a computer Ans



- ◊ Cache
  - ◊ CPU (Central Processing Unit)
  - ◊ CU (Control Unit)
  - ◊ ALU (Arithmetic and Logic Unit)
- Note:- previously asked  
from theory sheet 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 Please Solution 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 sustain the data even when power is turned off.
2. Working type	Data stored in RAM can be overwritten and allowed	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	Slow than RAM
5. CPU instruction	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, memory manager, firmware, micro controller.	Lecture Note: Page. 5-

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<u>8. Accessibility</u>	The data should be easily accessible.
9. cost	cheaper than RAM

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

or

Difference between low level language and high level language.

All

Low level languages



High level languages



Advantage

- ① They are faster than high level language.

- ② Low level language are memory efficient.

- ③ No need of translator i.e. except assembler from AL.

- ④ Low level language are difficult to learn.

- ⑤ They are machine dependent and are not portable.

Disadvantage

- ① Compiler & interpreter is needed to convert HLL.

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- ④ High level language are difficult to learn.

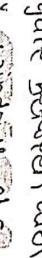
- ⑤ They are machine dependent and are not portable.

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① They are more error prone.	② They are less error prone.
③ Debugging and maintenance is difficult.	④ Debugging and maintenance is comparatively easier.
Ex:- Machine & Assembly language	Ex:- C, C++, Java

Ques: What is operating system? what are the various components of operating system. Describe the functionality 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 or resource allocation, as it provides all necessary resources (hardware, software or files) to application execution inside a computer system, like to play a song, it allocates operational mouse, monitor, speaker, ram, hard disk, buses, processor etc to application.

Component of OS:

- ① Process management: ① Creating and deleting both user and system process.
- ② Scheduling and managing process.
- ③ mechanism for process synchronization.
- ④ Provide mechanism for process communication & deadlock handling.

- (2) Main Memory Management:  
① Deciding which process are to be loaded into memory when memory space become available.  
② Allocating and deallocating memory.
- (3) Secondary memory management:  
① Allocation & deallocation of memory  
② keep track of disk address i.e. no. of surface track & sector.
- (4) Input / output management:  
① It also control device driver interface.  
② mapping files and backup files.
- (5) File management:  
① creating & deleting files and subdirectories.
- (6) Service of OS / function of OS
- Ques: Why operating system is required? What are the types / classification of operating system? (2015-16)
- Ans: Need of OS:  
① manage the computer resources such as the CPU, memory, disk drive and printer.  
② establish a user interface.  
③ execute and provide services for application software.

- (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.  
Running the same file, resource may be allocated to each of them.

- (4) Protection: It involves ensuring that all access to system resource is controlled.
- (5) Accounting: To keep track of which user has how many and which kind of computer resources.

- 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) Multiprogramming OS: The OS switch to and execute other job when job need to wait & run to return back when job gets resource so CPU is idle.

- (3) Time sharing OS: It is also known as multiplexing. 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 highly coupled system such system have more than one processor in close communication with each other share the computer bus, clock, memory & peripheral devices, they are symmetric or asymmetric.

### (5) Distributed OS:-

- ① Loosely coupled system.
- ② There two or more system are working together but no sharing of system clock, bus and memory is required.

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

- ③ They are classified as hard and soft real time OS.

!! Q 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 :- Clean 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:

- FORMAT → This command will create track & sectors on a disk.

- ATTRIB :- It changes or display the attributes of a file.

- ANDROID : It is a powerful operating system supporting large no. of application in smart phones.

- EDIT : This is used to change the data of a file.  
LABEL : It is used to create, change, delete the volume label of a disk.

Q Give difference between android and windows os - (2015-16)  
 (odd/Even)

<u>Android</u>	<u>Windows</u>
1) Graphics	Relatively Optimized
2) Source code	Open source code
3) Security	Comparatively less
4) Application	Android for mobile known for PC
5) Developers	Google Microsoft

Ques 11: What is algorithm? write the characteristics of an algorithm!

A: 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 do not 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 12: what is flowchart? draw a flowchart to find maximum of three numbers and sum and average of those number also. (2016-17, 2015-16)

A: It is a pictorial representation of the sequence of operation

necessary to solve a problem with a computer, it is given by John Von Neumann 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(i) If true, then check if A is greater than B.

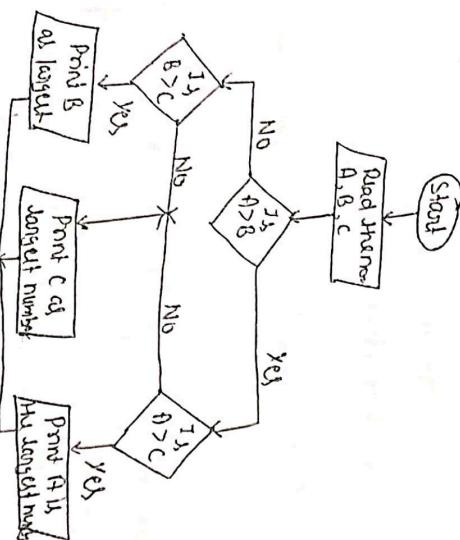
3(ii) If true, print A as greatest number.

3(iii) If false then check if B is greater than C.

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

3(v) If false print C as 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 Declared a variable "sum" & "Avg",

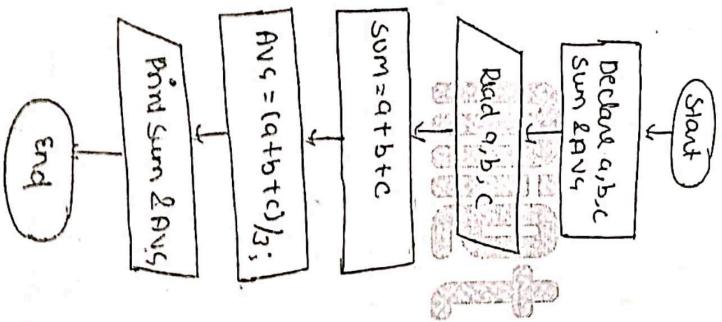
④  $Sum = a + b + c$

⑤  $Avg = Sum / 3$

⑥ Display "sum" and "Avg"

⑦ End

Flowchart



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

Algorithm

① Input N

② Sum=0

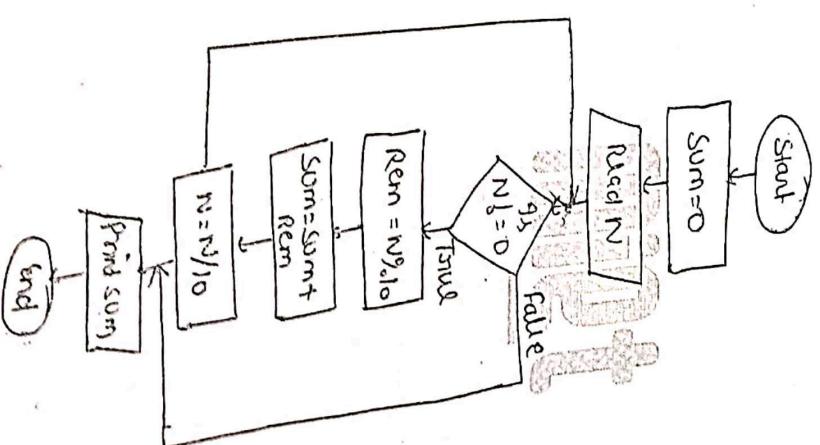
③ While (N != 0)

    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 is an integer variable.

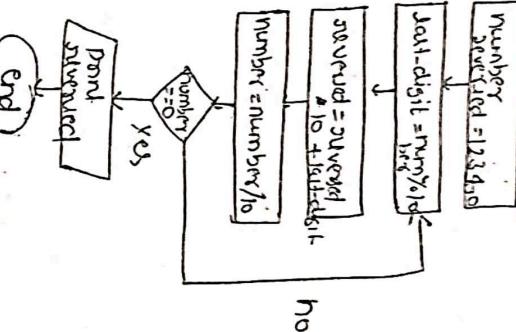
- (3) Get the last digit of the given number by performing the modulo division (%) and store the value in last digit variable

$$\text{last-digit} = \text{number \% 10}$$

- (4) Reversed = Reversed \* 10 + last-digit

$$\text{number} = \text{number} / 10$$

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



Ques 13 Differentiate (i) Algorithm & Flowchart (ii) Pseudo code and flowchart. { 2017-18, 2015-16, 2016-17, 2018-19 }

### (i) Difference

Basic	Algorithm	Flowchart
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An algorithm is a step by step method for solving some problem.

Algorithm is graphical representation of an algorithm.

Flowchart is graphical representation of logic.

Hard to understand

Easy to understand

No symbols employed for algo.

No symbols, we plain text

Easy to debug

Use of symbols

Hand to debug

Ex:  $\square$ ,  $\square$ ,  $\square$ ,  $\square$

Nature

Pseudocode

Graphical representation of logic

### (ii)

pseudo code

Flowchart

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

A diagrammatic representation that illustrate a solution model to a given problem

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

written using various symbols.

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

Ques Difference between (i) compiler and interpreters ?

(ii) Linker 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 at a whole	Display the syntax error line by line

Execution time

The overall execution time is faster

The overall execution time is slower

Debugging

- Exe file is generated

Debugging is easy

- Exe file is not created using interpreter

Example.

Programming language like C, C++ uses compiler (Turbo C, cc)

Programming language like Python, Java uses interpreter

(iii) 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 object code generated by a compiler

an assembler

Output

It takes executable module generated by a linker

Ques Why C programming is called structured programming?

- Ans
  - ① It solve a large problem.
  - ② It can divide ~~the~~ problem into smaller structured blocks each of which handles a particular subproblem.
  - 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 Explain basic structures of C program?

Ans Documentation (Documentation section)

o Preprocessor statements (Link section)

o Global declaration (Definition)

o The main() function

o Local declaration

o Program statement and expression

o User defined function

```
#include <stdio.h>
```

int main()

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

Ques While compiling the code would the name of two syntax

Ans While compiling the code would the name of two syntax

and two logical errors?

Ques A missing semicolon(;) at the end of a line or an extra bracket at the end of function, may cause

a syntax error.

Ques Logical error is a bug or mistake in source code

that result in incorrect output.

Ques How binary file differ from text file?

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

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

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

- Editor

- 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 - i) Notepad, NetBeans IDE

Procedural Programming: It is a type of language that

specifies a series of well-structured steps or procedure within its programming context

to compose a program.

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

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

- Program executed, but no output

- It produce incorrect answers

- It does not stop running

explain all above condition in detail.

Ques (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.

(iii) A1 produces incorrect output 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.

(iv) This happens when we make use of correct syntax statement but incorrect logic like if (i<=1)

count++;

instead of using comparison operators we can use assignment which is syntactically correct & so count++ is always executed something in infinite loop.

Ques 22 why do curly braces denote in C? (2015-16 316-17)

Ans if 3 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  
② when we say Input, it means to feed some data into a program.

③ An input can be given in the form of a file or from the command line.

④ 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.

⑤ 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 stdio.h header
- ③ getch() & putch()
- ④ getchar() & putchar()

Ques 24 what is special about void pointer?

Ans ① A void pointer is a pointer that has no associated data type with it.

② A void pointer can hold address of any type and can be converted to any type.

Ques 2 Difference between

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

- ⑤ When ended with file in " " (quoter) then compiler first checks it in current directory where the command is being issued.
- Ex: i.e. TC

- ⑥ When enclosed header file in < > then it search in standard directories where usually header file reside.

Ex: C:\TC\BIN\TC

Ques 3 What is the difference between .obj and .exe files?

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

- ⑦ While an executable file is a file generated after linking a set of object files together using a linker.

Ques 4 Difference between int main() and void main()?

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

Ques 5 What is getch() and putch()?

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

- ⑧ getch() is used to get/ read a character from keyboard input.

Ques 6 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.

- ⑨ gets() is a function that read a string from standard input.

Ques 7 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.

- ⑩ printf() and scanf() are Formatted I/O
- ⑪ getch(), getchar(), getchar(), gets(), puts(), putchar(), etc are unformatted I/O

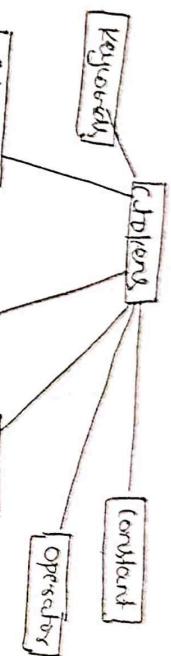
scanf() and printf(): The standard I/O header file named stdio.h contain the definition of

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 question

- ↳ getch() & putch()
- ↳ getchar() & putchar()

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



- (1) Keyword: whose meaning is already defined in library  
 (2) Identifier: known as user-defined word  
 (3) known as variable, whose value may be changed any time during execution of program.

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

(5) string: it is the collection of characters, digit or special symbol enclosed in double quotes terminated by null character like "Hello".

(Ex) `void main()`  
 keyword → void, int, float  
 identifier → f, ac, cc, point, scan  
 constant → 3.14, 2, \t  
 operator → =, &  
 String → enter radius  
 printf("Enter radius");  
 scanf("%f", &r);  
 $ac = 3.14 * r * r;$   
 $cc = 2 * 3.14 * r;$  → `printf("Area = %f", ac);`

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

Ans. Data type is used to define the variables. As determine the type of value and the range of values 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	%hu	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 1.0E+4932

(6) enumerated data type is a user-defined data type. It is mainly used to assign names to integer constants, the names make a program easy to read and maintain.