

23/5  
Dhruba

## C- Programming

Thurs  
— + —

Q. Discuss the functional unit of a computer.

Ans:- A computer has the five functional unit.

- ① Input    ② memory    ③ Arithmetic & logical unit (ALU)
- ④ Control unit    ⑤ Output

Q. Input:- Through this unit all the informations and data enter to the computer from the user.

The input device to translate all the information and data to the computer language and express them in electronic impulses of voltage or current.

eg:- Keyboard, Hard disk, floppy, mouse are some input devices.

② Memory:- All the informations and data which are sent by the input device are not stored in memory last unit. stores

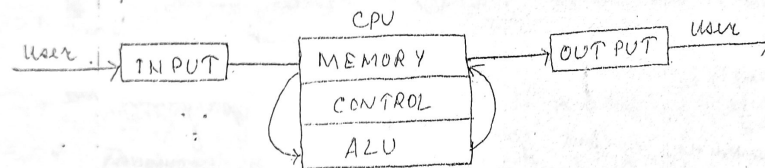
③ ALU:- ALU of a computer performs low cost of calculation and makes all mag and logical decisions. It picks up memory and manipulates it in accordance.

instruction and send back the result to the memory.

(4) Control unit:- Control unit is the main part of a computer. All the units of a computer are controlled by this unit.

<sup>with</sup> Output:- All the results and decisions are <sup>P.P</sup> output through this unit. It picks up all the informations and translate them into understandable form and present them to the operator.

eg:- printer, monitor etc are some of the output devices.



CPU → Central processing unit. It consists of memory, control unit and ALU. It is used to process the data and it is the main part of a computer.

main memory:-

Random Access Memory):- Random Access

a temporary storage medium in a computer. All data to be processed by

The computer are transferred from a storage device or keyboard to RAM during data processing. Results obtained from executing any program are also stored in RAM. All data stored in RAM will be ~~erased~~ <sup>2008, 2009</sup> when the computer is switched off. RAM is a volatile memory.

\* ROM (Read Only Memory) :- ROM is a permanent storage medium which stores start-up programs (operating system programs). These programs are loaded to the computer when the computer is switched on. ROM is a non-volatile memory.

\* Secondary (memory) storage unit :- These units are used to store the data and programs permanently. For this reason they are also known as non-volatile memory or auxiliary memory. These stores large volumes of data and are also of low cost.  
eg:- Floppy drives, Hard disc drives, Magnetic Tape drives etc.

Q.1 An operating system is a program <sup>which</sup> ~~which~~ connects the user and the ~~electronic~~ hardware in a computer. It has a set of programs which supervise the activities of a computer and activate / control the operations of the hardware components such as CPU, main memory, disk drives, keyboard, monitor, printer and so on.

Some of the start up programs initially loaded to RAM are stored in ROM, mainly the Basic ~~Input~~ Input Output System (BIOS) programs which are ~~recood~~ recorded by the manufacturers of the computer system. Service programs available in O.S for operations like ~~so~~ copying a file, deleting a file etc. are usually stored in the disk. Any malfunctioning of hardware components are instructed to the user by displaying error ~~no~~ message on the screen by the O.S programs are also called system

Q.2 software <sup>2010</sup> ~~MS-DOS~~ (Microsoft Disc O.S), windows 98, UNIX, LINUX etc.

## Number System :-

① Binary no. system :- In this no. system, 2 is the base & 0, 1 are the digits.

$$\begin{array}{r} \text{Add :-} \\ 11010 \\ + 10011 \\ \hline 101101 \end{array}$$

$$\begin{array}{r} \text{Subtract :-} \\ 11011 \\ - 10101 \\ \hline 110 \end{array}$$

② Hexadecimal no. system :- Here base is 16. Digits are 0, 1, 2, ..., 9, A, B, C, D, E, F. where  
 $A=10, B=11, C=12, D=13, E=14, F=15$

$$\begin{array}{r} \text{Add :-} \\ 2A3BC \\ + DE46F \\ \hline 10882B \end{array}$$

$$\begin{array}{r} \text{Subtract} \\ 10882B \\ - DE46F \\ \hline \end{array}$$

$$\begin{array}{r} ABCD2 \\ + 23468 \\ \hline CF13A \end{array}$$

$$\begin{array}{r} CF13A \\ - ABCD2 \\ \hline 23468 \end{array}$$

$$\begin{array}{r} 611F \\ - 26B3 \\ \hline \end{array}$$

## Conversion to decimal no. system :-

(i)  $(11010)_2$

The decimal equivalent of  $(11010)_2$  is —

$$= 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

$$= 16 + 8 + 0 + 2 + 0$$

$$= 26$$

(ii)  $(101.1101)_2$

The decimal equivalent of  $(101.1101)_2$  is

$$= 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 1 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4}$$

$$= 4 + 0 + 1 + \frac{1}{2} + \frac{1}{4} + 0 + \frac{1}{16}$$

$$= 5 + 0.5 + 0.25 + 0.0625$$

(iii)  $(736.5)_8$

The decimal equivalent of  $(736.5)_8$  is

$$= 7 \times 8^2 + 3 \times 8^1 + 6 \times 8^0 + 5 \times 8^{-1}$$

$$= 478.625$$

(iv)  $(3FA.8)_{16}$

The decimal equivalent of  $(3FA.8)_{16}$  is

$$= 3 \times 16^2 + 15 \times 16^1 + 10 \times 16^0 + 8 \times 16^{-1}$$

$$= 1018.5$$

Conversion to binary system :-

Decimal to binary :-

(i) convert 75 to binary no. system —

Divided by 2      Quotient      Rem

| <u>Divided by 2</u> | <u>Quotient</u> | <u>Remainder</u> |
|---------------------|-----------------|------------------|
| $\frac{75}{2}$      | 37              | 1                |
| $\frac{37}{2}$      | 18              | 1                |
| $\frac{18}{2}$      | 9               | 0                |
| $\frac{9}{2}$       | 4               | 1                |
| $\frac{4}{2}$       | 2               | 0                |
| $\frac{2}{2}$       | 1               | 0                |
| $\frac{1}{2}$       | 0               | 1                |

∴ 75 is equivalent to  $(1001011)_2$

(ii) Convert 48 to binary system

|   |    |   |
|---|----|---|
| 2 | 48 |   |
| 2 | 24 | 0 |
| 2 | 12 | 0 |
| 2 | 6  | 0 |
| 2 | 3  | 0 |
| 2 | 1  | 1 |
|   | 0  | 1 |

∴ the binary equivalent of 48 is 110000

(iii) Convert 0.132 to binary system

multiplied by 2

$$0.132 \times 2$$

$$0.264 \times 2$$

$$0.528 \times 2$$

Product

$$0.264$$

$$0.528$$

$$1.056$$

Recorded bit

0

0

1

So, 0.132 is equivalent to  $(0.001)_2$

(10) Convert 0.562 to binary -

| <u>multiplied by 2</u> | <u>Product</u> | <u>Recorded bit</u> |
|------------------------|----------------|---------------------|
| $0.562 \times 2$       | 1.124          | 1                   |
| $0.124 \times 2$       | 0.248          | 0                   |
| $0.248 \times 2$       | 0.496          | 0                   |
| $0.496 \times 2$       | 0.992          | 0                   |
| $0.992 \times 2$       | 1.984          | 1                   |

So, the binary equivalent of 0.562 is  
~~0.562~~  $(.10001)_2$

Decimal to hexadecimal :-

(i) Convert 610 to hexadecimal system

| <u>Divided by 16</u> | <u>Quotient</u> | <u>Remainder</u> |
|----------------------|-----------------|------------------|
| $\frac{610}{16}$     | 38              | 2                |
| $\frac{38}{16}$      | 2               | 6                |
| $\frac{2}{16}$       | 0               | 2                |

So, the hexadecimal equivalent of 610 is

$(262)_{16}$

(ii) Convert 45 to hexadecimal

So, 45 is equivalent to  $(2D)_{16}$

(iii) Convert 11010.111 from binary to hexadecimal.

Sol<sup>n</sup>. The decimal equivalent of  $11010.111$  is

$$= 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 + 1 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3}$$

$$= 16 + 8 + 2 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8}$$

$$= 26 + 0.5 + 0.25 + 0.125$$

$$= 26.875$$

Divided by 16

$$\frac{26}{16}$$

$$\frac{1}{16}$$

Quotient

1

0

Remainder

A

1

So, the hexadecimal

equivalent of 26 is 1A

Multipled by 16

$$0.875 \times 16$$

Product

14

Recorded bit

E

So, the hexadecimal equivalent of 0.875 is E

So, the hexadecimal equivalent of  $(26.875)_{10}$  is

$$\text{i.e. } (11010.111)_2 \text{ is } (1A.E)_{16}$$

Q. Convert  $(101101101)_2$  to hexadecimal system.

$$\text{Ans. } (6D)_{16}$$

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Q. Convert 3A6C to binary.

Ans. The decimal equivalent of 3A6C is

$$3 \times 16^3 + 10 \times 16^2 + 6 \times 16^1 + 12 \times 16^0$$

$$= 14956$$

Munday

Divided by 2

Quotient

Remainders

$$\begin{array}{r} 14956 \\ \underline{2} \end{array}$$

7478

0

$$\begin{array}{r} 7478 \\ \underline{2} \end{array}$$

3739

0

$$\begin{array}{r} 3739 \\ \underline{2} \end{array}$$

1869

1

$$\begin{array}{r} 1869 \\ \underline{2} \end{array}$$

934

1

$$\begin{array}{r} 934 \\ \underline{2} \end{array}$$

467

0

$$\begin{array}{r} 467 \\ \underline{2} \end{array}$$

233

1

$$\begin{array}{r} 233 \\ \underline{2} \end{array}$$

116

1

$$\begin{array}{r} 116 \\ \underline{2} \end{array}$$

58

0

$$\begin{array}{r} 58 \\ \underline{2} \end{array}$$

29

0

$$\begin{array}{r} 29 \\ \underline{2} \end{array}$$

14

1

$$\begin{array}{r} 14 \\ \underline{2} \end{array}$$

7

0

$$\begin{array}{r} 7 \\ \underline{2} \end{array}$$

3

1

$$\begin{array}{r} 3 \\ \underline{2} \end{array}$$

1

1

$$\begin{array}{r} 1 \\ \underline{2} \end{array}$$

0

1

So, 346C is equivalent to  $(1101001101100)_2$

Measure of memory:- The memory of a computer is measured by byte, kilobyte (KB), MB, GB, GHz.

Bit stands for Binary Digit.

1 bit represents 0 or 1

$$8 \text{ bit} = 1 \text{ byte}$$

$$2^{10} \text{ byte} = 1 \text{ KB}$$

$$2^{10} \text{ KB} = 1 \text{ MB}$$

$$2^{10} \text{ MB} = 1 \text{ GB}$$

$$2^{10} \text{ GB} = 1 \text{ TB}$$

A single character covers 1 byte space in the memory.

(i.e. any character in the computer is stored in the memory as a string of 8 binary digits)

Hardware & Software

The computer system is divided by two parts, hardware and software.

Hardware - The physical part of a computer

which can be touched or can be seen is

called hardware.

eg:- monitor, CPU, keyboard, mouse, floppy, hard disk etc

Software :- The program of the computer is called software. A program is a set of instructions given to computer hardware.

eg :- M.S. Word, Tally, Games etc.

Language :- A computer has three types of languages - (1) Machine code or machine language.

(2) Assemble code or language.

(3) High level language.

Out of these three languages, the computer understand only the machine language, other two languages are translated to the machine language to understand by the computer.

A machine language is at the binary level i.e. machine language consists of bit pattern ASCII (American standard code for Information Interchange).

Both machine & assemble languages are called

the low level language.

① Machine language :- Machine language is the internal representation in the machine's store as a string of binary digits. A programmer are here familiar with the decimal system and are preferred to write the instruction in decimal and leave the input device to convert ~~the~~ these into binary system.

The set of ~~is~~ instruction codes created in conjunction with the computer designer is called machine code or machine language. It will be determined by certain design features of the computer itself.

② Assembly language :- The numeric machine code are very ~~at~~ difficult to remember and encoding is ~~too~~ laborious process and mistakes can be made easily. To overcome ~~the~~ this problem the idea of memory aid was introduced. The human mind can more easily identify with abbreviated word than a series

(2) of digits, as for an example a computer may design. so to interpret the machine code 1001 as the operation multiply but it is very easier for human being to remember it as MULT.

The MULT has to be translated into binary pattern 1001 before the machine can understand and execute <sup>not</sup> the act of translating the assemble language program to the machine code i.e. to binary form is carried out by a special pre-stored program called <sup>2009</sup> assembler. ~~It~~ <sup>It</sup> translates the program written by the programmer into dead version which the machine can recognize and respond to and assembles it in the main memory for execution and hence it is called assemble code.

eg:- computerised copier machine,  
computerised telephone billing etc.

(3) High level language:- This language, instead of being machine based are oriented more

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towards the problem to be solved. Such problem oriented language enables the programmer to write instructions using certain English words and conventional mathematical notation, therefore making it easier for the programmer to think about the problem. In high level language the programmer can save a great deal of time and efforts. The high level language can be used on almost any computer. No computer can recognize the high level language until it has been translated to machine language.

For example if we try to multiply two nos. and add a third no. to the product then in algebraic notation we write it as  $x = a \times b + c$ , but in the high level language the above can be written as

$$x = a \times b + c$$

eg:- C, C++, FORTRAN, COBOL, PASCAL etc are some high level languages.

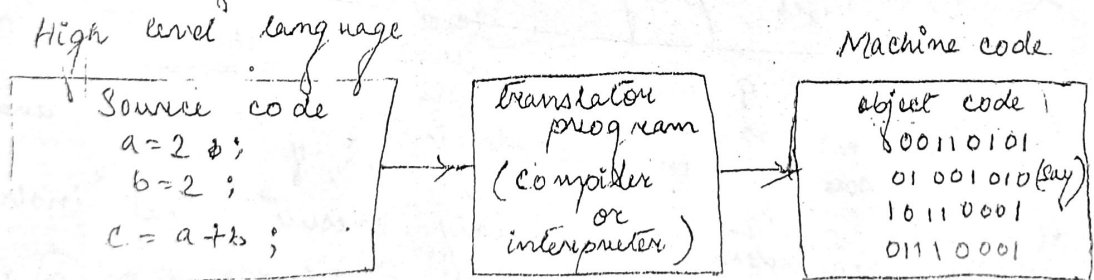
Read  
more

Translation stage :- Computer needs to have a high level language program translated into machine code before it can be understood and obeyed. This translation stage is carried out by a specially written program depending on the high level language ~~is~~ used. The translator may be a compiler or an interpreter.

This programs ~~so~~ are pre-stored in ROM.

<sup>Q.106, 12009</sup>  
The programmers code in high level language is called source code or source program.

The translator will convert this source code to machine code ~~and the result is~~ called object code or object program.



Both the source code and object code are some program but in different format. The source code is easily written and understood

by programmer and the object code is understood by the computer.

Q.1 The process of translating the source code into object code is called compilation and the program which translates it is called compiler. A compiler itself is a large program written in machine code and is a part of software supplied by the computer designer.

Compiler

Q.2 Compiler vs Interpreter

Q.2 Compilers convert the source program into object program before the program is executed. Interpreters on the other hand convert one source instruction into object code and the computers immediately execute that instruction before moving on to translate the next instruction. This means that some instructions such as repeated loops may be re-interpreted again and again and so the interpreted program may tend to take longer time to complete execution than the compiled program.

de  
PI  
10 (say)  
PI  
PI

2/11/18) v. imp (However an advantage of the interpreter is that if an error is made in a given instruction the programmer ~~knows~~ knows exactly at which point the error has occurred.)

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Wednesday

Testing and debugging:- First time execution of a program is generally not achieved however experienced the programmer is. Different types of errors <sup>creep</sup> ~~seep~~ into the program. They are of the following types-

① Syntax error:- Grammatical mistakes (violation of rules) performed in writing the program. (This error is detected by the compiler)

② Logical error:- (not detected by compiler)

eg:- of <sup>(float)</sup>  
 $x = y$

1.234567|0

1.234567|1

③ Run time error:- (not detected by compiler). This types of errors met with during the run time. (mainly data mismatch)

④ Latent error :- (Not detected by compiler).

It occurs mainly for <sup>certain</sup> ~~certain~~ set of data.

Testing is generally done by two process —

① Human testing

↓  
By experienced programmer

(and modular programming is used)

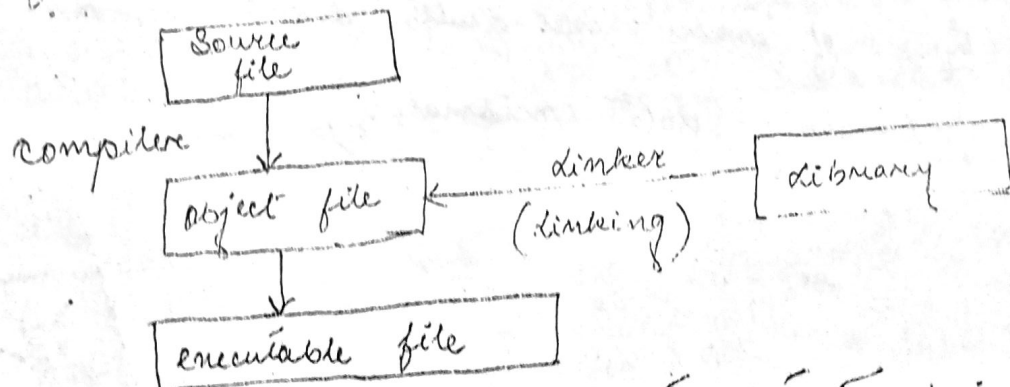
② Computer based testing

↓  
with the help of the compiler.

Debugging : → It is the process of isolating and correcting errors.

In case of debugging, the print statement is used intelligently to detect the error.

Linking & Loading :- Linking is the process of putting together other program files and functions that are reqd. by the program.



loading actually means ~~transfer~~ transferring from

secondary memory to primary memory.  
↓ ↓  
(eg - Hard disk) (eg - RAM)

Text editor :- A text editor is a program which is used to type and edit the computer program or document. Commonly used editors are Turbo, NE (Norton Editor), Micro-  
Neditor (used in UNIX system) etc.

2010  
Q.P Algorithm :- An algorithm is a stepwise outline to a problem. This outline shows the precise order in which the program will execute individual func<sup>n</sup> to arrive at the solution. It is extremely important and it has max<sup>m</sup> effect of efficiency of a program.

Flowchart  
Flowchart :- A flowchart is a depiction of an algorithm which describes the steps of the algorithms and the order in which the steps are to be carried out. It is an explicit set of instructions that describe the procedure to solve the problem. The flowcharts are depicted with ~~the~~ standardized figures to show the programming instruction. By combining the

figures we can generate a map of the algorithms which makes it much easier to visualize the sol<sup>n</sup> to the problem. A flowchart is just like a road map. A flowchart helps in giving an overview and dir<sup>n</sup> of flow of the program. It serves as a mean of communication bet<sup>n</sup> a programmer and the specialist who does the problem planning. Flowchart also helps in avoiding omissions by dividing the program into discrete steps.

(A flow chart is a diagrammatic or symbolic representation of an algorithm. It uses various symbols to represent the operations to be performed).

### Symbols of flowchart :-

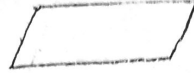
① Terminal symbols :- A circle or an ellipse or an oval are used as terminal symbols for the word START and STOP which are written into the symbols. The terminal symbols are

START

START

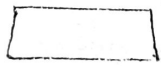
② Flow symbols :- The flow of a program is depicted by an arrow and may be either vertically or horizontally ( $\rightarrow$ ,  $\downarrow$ ,  $\leftarrow$ ,  $\uparrow$ )

- (3) Input / Output Symbols :- A parallelogram is used to show any of the various forms of input and output.



In case of input we write READ & in case of output we write PRINT or WRITE within the parallelogram.

- (4) Process symbols :- A rectangle depicts a process symbol and the process involved may be explicitly written within the rectangle. A process symbol is used to indicate that some computerised computational steps is to be carried out. The process symbol is



- (5) Decision symbol :- A diamond shaped symbol is used to indicate a decision point in a program. A decision symbol is always connected to two other flow symbols one of which is depicted for yes and the other is depicted for no. The decision symbol is

