

COMPUTER ARCHITECTURE

OVERVIEW:

In 1951 John Von Neumann and his team proposed a design of stored program computer. According to the design:

- A sequence of instructions is called a program.
- All the data and the programs are stored in memory.
- The machine reads all the instructions one by one and executes these instructions sequentially.

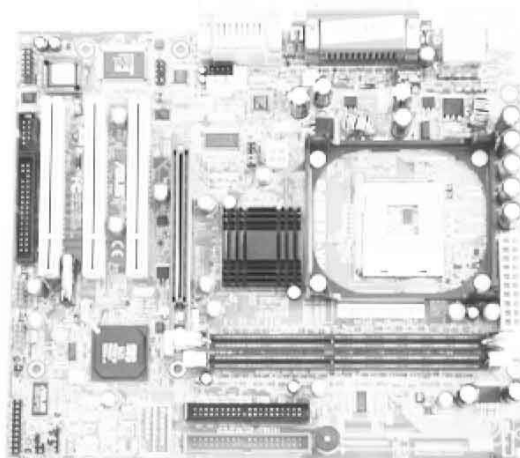
Q1. What is Computer Architecture? Describe the components of Architecture.

COMPUTER ARCHITECTURE:

- The organization and interconnection of various computer components is called computer architecture.
- The important components are: I/O devices, CPU, Primary or Main Memory, Secondary Memory or Storage devices, I/O unit, Registers and Bus Interconnection

I/O devices:

- It stands for input and output devices.
- Input devices: User can communicate with the computer through input devices e.g. Keyboard, Mouse, joystick, track-ball, Microphone, camera, scanner, bar code reader etc.
- Output devices are used to communicate with the user e.g. Monitor, Speakers, Printers and Projectors etc.



CPU:

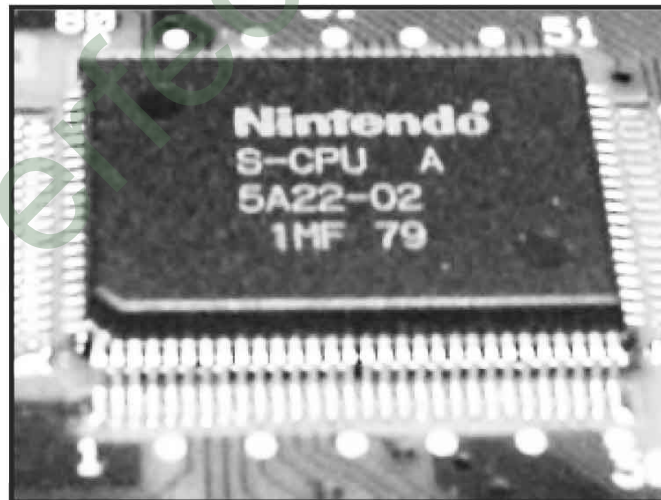
- It stands for “central processing unit”.
- It is a small chip mounted on the circuit board (mother board).
- CPU is the brain of computer. It controls all the functions of computer system.
- CPU also performs data processing.
- There are two parts of a CPU, CU and ALU

CU:

- It stands for “Control Unit”. The CU reads the instruction from memory, decodes and executes these instructions.
- It acts as supervisor of the computer. It controls all the parts and activities of the computer.
- CU generates electronic signals that direct the computer to execute the programs it doesn't itself execute the instructions rather it directs the other parts to do so.
- It also controls the flow of information and co-ordinates the activities of other devices.

ALU:

- It stands for “Arithmetic and Logical Unit”.
- It performs two types of operations on data.
- Arithmetic operations (addition, subtraction, multiplication and division)
- Logical operations (the operations produces true or false results e.g. less than, greater than, equal to not equal to etc.)



Main Memory or Primary Storage:

- All the program instructions and data are loaded in memory for the execution.
- This unit temporarily stores the data and instructions.
- It is also called working area of the computer. A computer cannot work without memory.
- There are two types of memory: RAM (Random Access Memory) and ROM (Read Only Memory)

Secondary Storage devices:

- These devices are used to store data permanently in the computer for later use.
- These are CD's, Hard Disk, and Floppy Disk etc.

I/O unit:

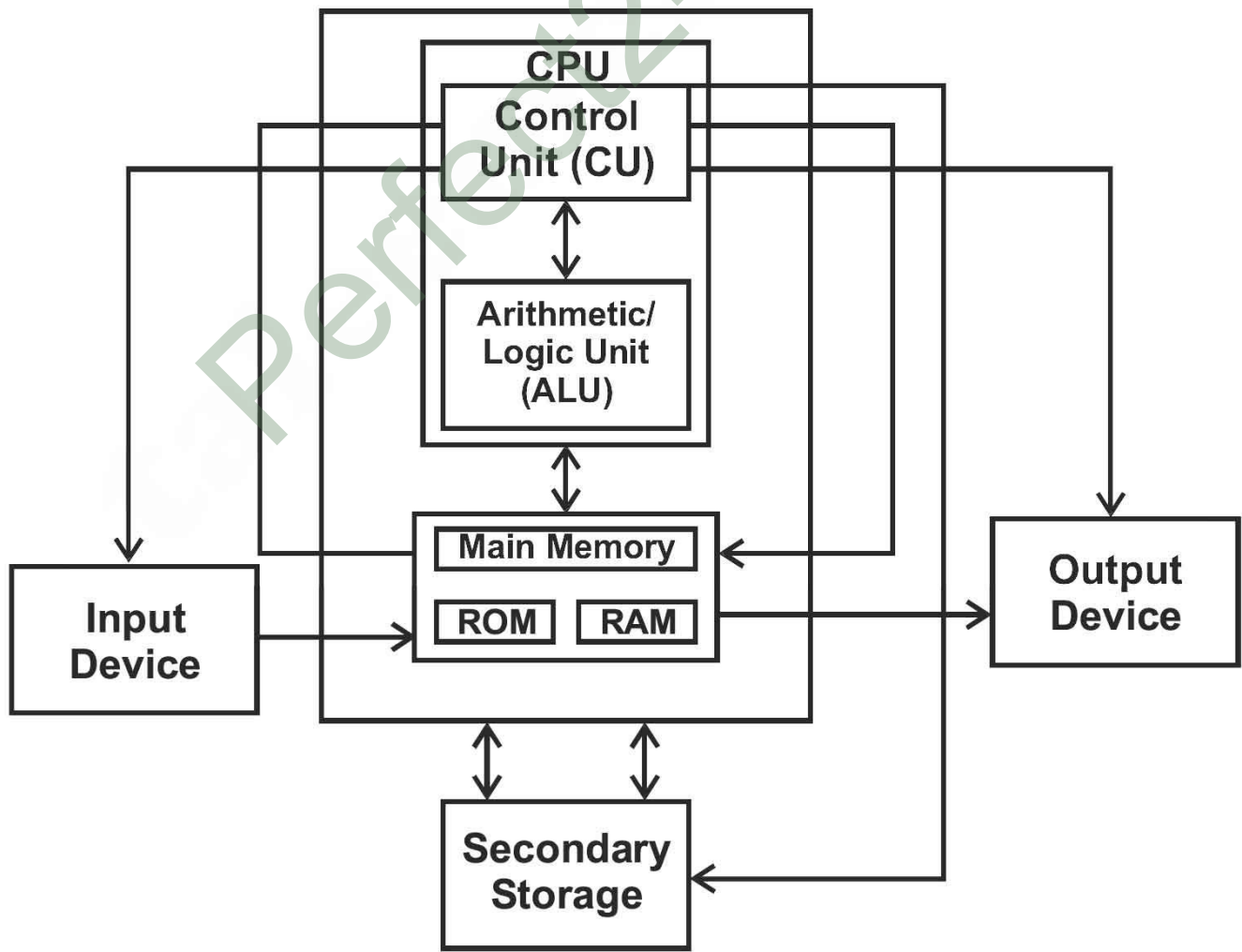
- It helps the processor to communicate with its peripheral devices.
- These are disk drives, monitor, printer etc.
- I/O unit controls different devices attached with computers.

Register:

- These are the high-speed memory locations built into the microprocessor. The CPU uses these locations to store data and instructions temporarily to perform certain operations.
- Data is processed and transferred from one component to another with the help of registers.

Bus Interconnection:

- It is used to connect different parts of the computer. It is a communication channel all the data instructions and commands flow through the bus interconnection.



Q2. What is Computer Memory? Describe its types.

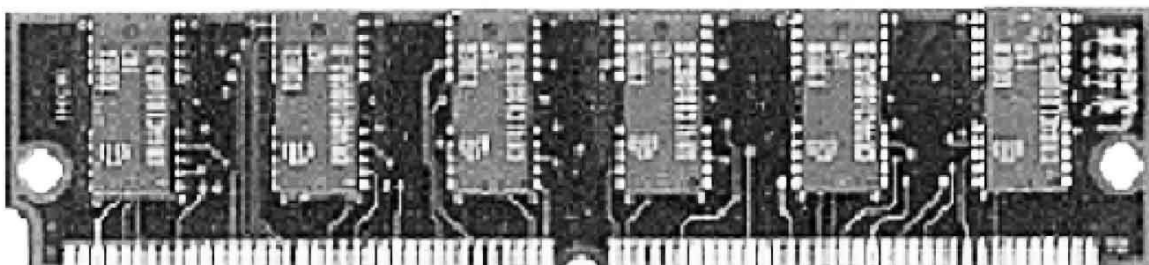
MAIN MEMORY:

- It is called working area of the computer. All the programs and data are stored in memory.
- A computer cannot work without main memory.
- It is a chip of semi-conductor material.
- Memory consists of identical cells. These cells are logically organized into a group of 8-bits (1-Byte). Each memory cell has a unique address.
- Data and instructions are stored in these cells in the form of bits.
- It is possible to randomly select any memory cell directly to store and retrieve data and instructions because each location of memory is accessible in equal time.
- It is faster than other storage devices.
- **Types of Memory:**

RAM (Random Access Memory) and ROM (Read Only Memory)

RAM (Random Access Memory)

- Primary storage is also called RAM (**Random Access Memory**).
- It is used as read/write memory. It is also called volatile and user memory.
- The contents of RAM are lost if the electric supply is switched-off.
- Random Access Memory or RAM is the memory that the computer uses to temporarily store the information as it is being processed. The more information being processed the more RAM computer needs.
- RAM memory chips are available in different sizes and speeds, which are from 64MB to 2GB.
- As computer technology changes the type of memory changes and making old memory chips obsolete.
- It improves the data processing speed of the computer.



Types of RAM:

SRAM, DRAM

SRAM:

- It stands for static random access memory.
- No refreshing is required in SRAM.
- These chips are faster than DRAM.
- SRAM uses less power than DRAM.
- Its design is more complex than DRAM.
- SRAM is more expensive than DRAM.

DRAM:

- It stands for dynamic random access memory.
- It is slower than SRAM
- It requires refreshing.
- Its design is simple and is not expensive.
- **EDO-DRAM:** EDO-DRAM is an example of DRAM. It stands for Enhanced Data output Dynamic Random Access Memory. It is 50% faster than ordinary DRAM

CACHE MEMORY:



- It is very high speed memory. It is used to increase the speed of processing
- It is small memory between CPU and main memory.
- Its access time is close to the processing speed of CPU.
- It is used to store the frequently used programs and data.
- By making active programs and data available to the CPU at a rapid rate, it is possible to increase the performance of a CPU.

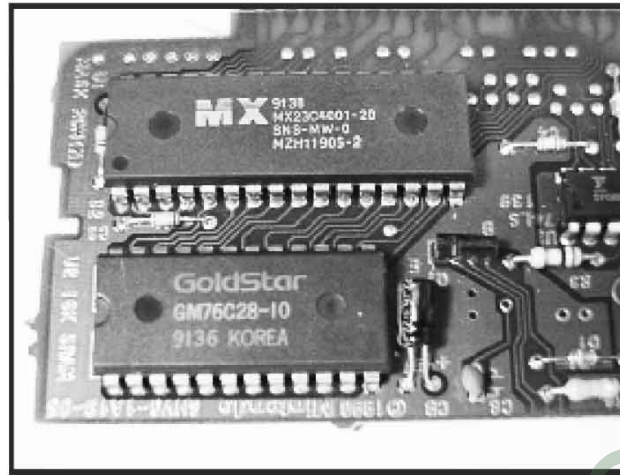
ROM (Read Only Memory):

- The contents of ROM are read only.
- New data cannot be written on it.
- Its contents are permanent.
- The system manufacture writes the ROM instructions and data at the time of manufacturing and the data and instructions cannot be changed afterwards.
- It is also called non-volatile, or system memory.
- When the power is switched off, the contents of ROM do not lost.
- As ROM is supplied by the manufacturer therefore it is impossible for the users to modify the stored programs in ROM.

- ROM chips are used to store frequently used programs like operating system routines and data which is not supposed to be change for a long time.

- **Types of ROM:**

PROM, EPROM, EEPROM



PROM:

- It stands for programmable read only memory.
- It is initially blank and the manufacturer writes instructions and data with some special devices.
- Once the information is stored onto PROM, then it cannot be changed.

EPROM:

- It stands for erasable programmable read only memory.
- It is another type of ROM chip and it is possible to erase the stored information and the chip can be reprogrammed using special devices.
- Information can be erased using ultraviolet rays.

EEPROM:

- It stands for electrically erasable programmable read only memory.
- It is a kind of ROM chip that can be re-written using electrical devices.
- The stored information on EEPROM can be erased, modified or reprogrammed easily using special devices.

Q3. What is Computer Bus? Describe its types.

COMPUTER BUS:

- It is a set of parallel lines used to connect two or more devices of a digital computer.
- It is the most important component of computer architecture. A computer has more than one bus interconnection.

- All the components of a computer are connected with a set of parallel lines. All these lines are used to transfer data in the form of bits from one component to another component. These lines are called BUS.
- There are two types of buses: System Bus and Expansion Bus

SYSTEM BUS:

- System bus is used to connect main components of the computer.
- Generally there are 70-100 parallel lines in system bus.
- It is divided into three main categories.
 1. Control Bus
 2. Address Bus
 3. Data Bus

Control Bus:

- These lines are used to transfer control signals from one component to another.
- It specifies the type of operation that is to be performed.
- It also transmits the control signals like ACKS (acknowledgement signal). When a CPU gives command to the memory for writing data, then the memory sends an acknowledgement signal to the CPU after successful writing of data.
- A few commonly control signals are:

Command/ Control Signal	Meaning
MEMORY WRITE	It is used to write data to a given memory location
MEMORY READ	It is used to read data from a given memory location
I/O WRITE	It is used to write some data on output device.
I/O READ	It is used to read some data from input device.
BUS REQUEST	It is used to request a control on the bus so that the requesting device can use it to transmit data.
BUS GRANT	It is used by the bus controller to indicate the grant of the bus to a device.
TRANSFER ASK	This command is used to request for data transfer.

ADDRESS BUS:

- It is a part of system bus. It is used to carry address signals to read and write data in the memory.
- Address bus is uni-directional.
- An address is a unique ID of each component connected to the system bus. It is called address of the component.
- When a component of a computer wants to communicate with another, it uses a few system bus lines to specify the address of destination; these lines are called address bus.

Data Bus:

- Data bus is used to transfer the data from one component to another.
- There are 32 or 64 parallel lines of data bus.
- The amount of data that a bus can transmit is called **bus-width**. A 64-line data bus can transmits 64 bits (8-bytes) at a time.
- If more lines are present in the bus, it can carry more data.
- Width of data bus has direct impact on the performance of the computer.
- Data bus is bi-directional.

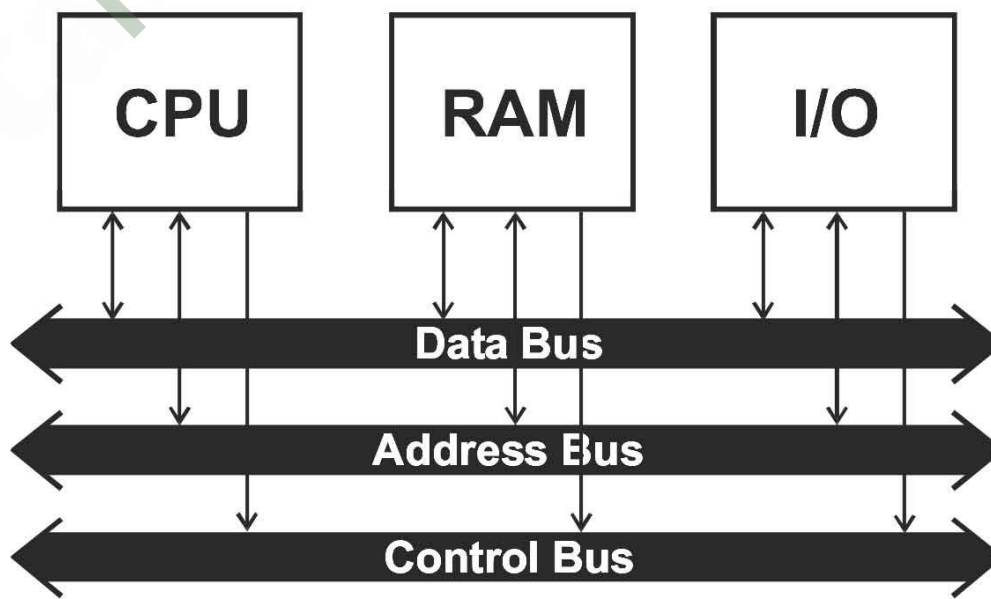
Expansion Bus:

- The major components are connected to the system bus and the remaining components are connected to expansion bus and the expansion bus is connected to the system bus.
- If all the components are attached with system bus then it will slow down the computer. All the components will have to wait longer to get access to the bus. We use the expansion bus to solve this problem.

Q4. What is I/O Unit? Describe Interrupts and DMA.

I/O UNIT:

- It handles the processor's communication with its peripheral devices.
- It is the part of a computer that is used to control the I/O devices.
- The I/O unit is responsible for controlling the different devices attached with it.
- It is also responsible for the compensation of speed difference between processor and I/O devices.
- Only the I/O unit is connected to the system bus and the remaining components are attached with I/O unit.
- There are two ways to transfer data from peripheral devices to the CPU. Interrupts and DMA



INTERRUPTS:

- Interrupts are the signals generated by I/O devices. These signals inform the CPU about the occurrence of certain events such as completion of an I/O operation. The CPU stops all operation and control is transferred to interrupting device.
- The disadvantage of this scheme is that it reduces the overall performance of the processor.

DMA:

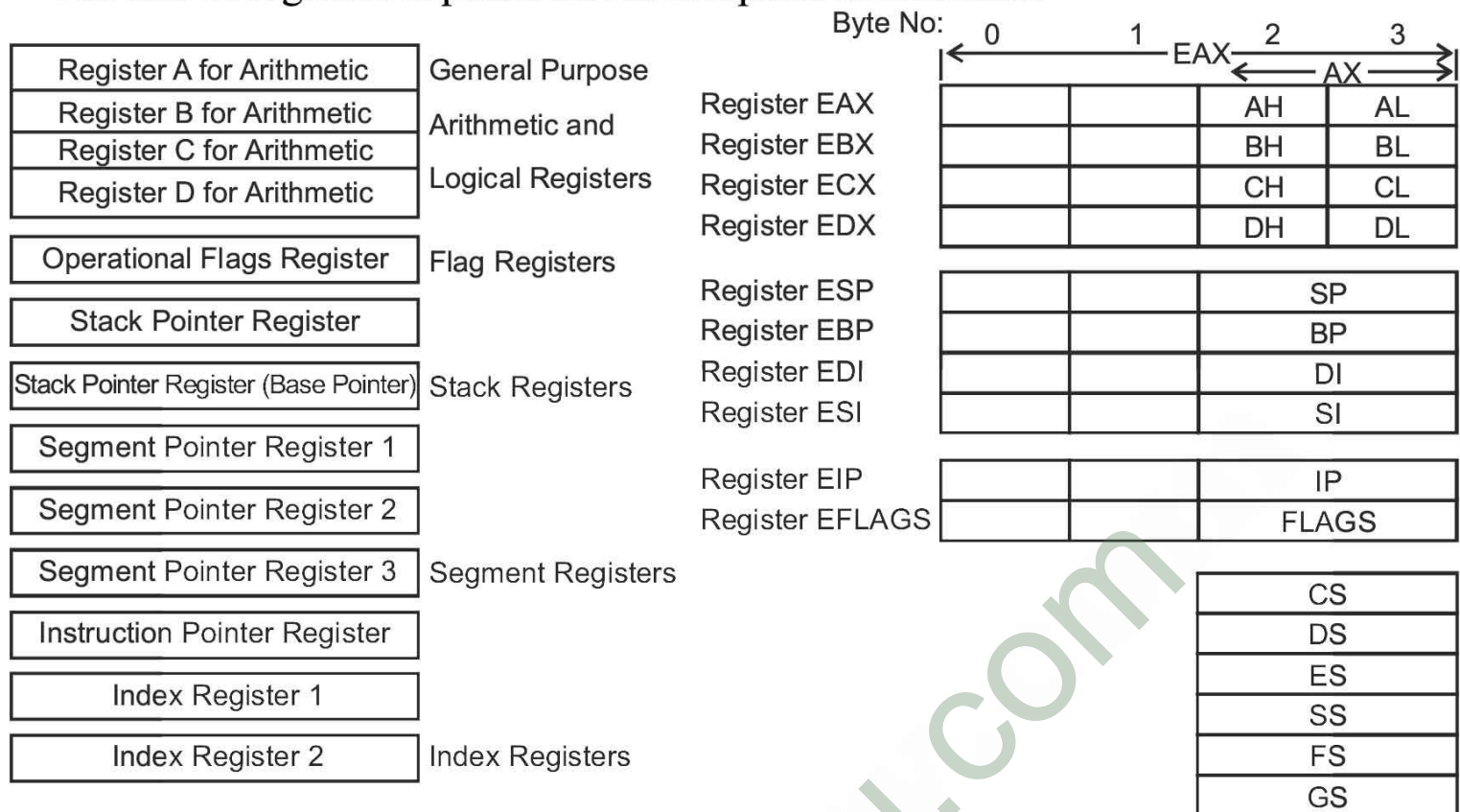
- It stands for direct memory access. It is a technique of performing an I/O operation in which I/O operation is completed without involving the CPU.
- The CPU just issues an I/O command and the rest of the work is completed with the help of a special DMA module (DMA controller).
- CPU then continues to do the other task when I/O operation is completed the DMA module sends an interrupt signal to CPU. Thus the CPU is involved in the beginning and at the end of I/O operation and the performance of the CPU is increased.
- The disadvantage of DMA scheme is that it is more complex and more hardware is required.

Q5. What are Registers? Describe register types.

CPU REGISTERS:

- These are the high speed memory locations built into the microprocessor. The CPU uses these locations to store data and instructions temporarily for processing.
- CPU processes, stores and transfers data from one component to another with the help of registers.
- The number of registers varies among computers.
- It increases the performance of CPU.
- Each register receives the information, holds it temporarily and passes it on, as directed by CU.

- The size of registers depends on the computer architecture.



• Types of Registers:

- PC (Program Counter)
- IR (Instruction Register)
- MAR (Memory Address Register)
- MBR (Memory Buffer Register)
- IP (Instruction Pointer)
- SP (Stack Pointer Register)
- GPR (General Purpose Registers A, B, C, D)
- Address or segment Registers (CS, DS, ES, SS)
- Index Registers (DI, SI)
- flag register

PC (Program Counter):

- It holds the address of the next instruction to be fetched and executed.
- When instruction is fetched, the value of PC is automatically incremented and it points to the address of next instruction.

IR (Instruction Register):

- It holds the current instruction that is being executed.

MAR (Memory Address Register):

- It holds the address of active memory location.
- When CPU wants to stores or read data from the memory, CPU stores the required address of memory location in MAR.

MBR (Memory Buffer Register):

- It holds the contents of the memory location read from or written in the memory.

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SP (Stack Pointer Register):

- Arrangement of data is called **stack** and data is stored in or retrieved from stack using LIFO (last in first out).
- LIFO is also known as FILO (first in last out). PUSH and POP instructions are usually used in stack to store or retrieve the values.
- SP register is used to manage the stack and it stores the value of top of stack.

GPR (General Purpose Registers A, B, C, D):

- These registers are used to perform arithmetic and logical operations.
- EAX, EBX, ECX, EDX are 4 byte registers. AX, BX, CX, and DX are 2 byte registers. AH, AL, BH, BL, CH, CL, DH and DL are 1 byte registers.
- There are four general purpose registers.

AX stands for Accumulator Register:

- It is used for arithmetic and logical operations.
- It holds the initial data to be operated upon, and the final results of processing.
- The results of arithmetic operations are returned to accumulator for transfer to the main memory through buffer register.

BX stands for Base Register:

- It is used for arithmetic and data movement operations.

CX stands for Counter Register:

- It is used for counting purpose.
- It acts as counter in loops.

DX stands for Data Register:

- It has special role in division and multiplication.
- The size of these registers is from 1 to 4 bytes.

Address or Segment Registers (CS, DS, ES, SS) :

- It is a group of 4 registers CS, DS, ES and SS.
- Size of each segment register is 2 bytes.

CS (Code Segment) Register:

- It holds the base location of all executable instructions in the program.
- CS along with IP register fetches the next instruction.

DS (Data Segment) Register:

- It is the default base location for memory variables.
- DS points to data in memory using DI or SI registers.

- CPU calculates the offset of variables using the current value of DS.

ES (Extra Segment) Register:

- It is an additional base location for memory variables.

SS (Stack segment) Register:

- It contains the base location of the current program stack.

IP (Instruction Pointer) Register:

- CS along with IP register fetches the next instruction.

Index Registers (DI, SI):

- DS points to data in memory using DI (Destination Index) or SI (Source Index) registers.

Q6. What is an Instruction set and explain types of Instructions?

TYPES OF INSTRUCTIONS:

- Each CPU provides a number of instructions to perform different operations.
- The set of all the instructions provided by CPU is called **Instruction Set**.
- The instruction set increases the performance of a CPU.
- There are four types of instructions provided by a CPU.

Data transfer instructions

Arithmetic and logical instructions

I/O instructions

Control Transfer instructions

Data Transfer Instructions:

- These instructions are used to transfer data from or to the memory.
- The professionals use these instructions to bring the data into CPU and copy data from CPU to the memory.

Arithmetic and Logical Instructions:

- CPU can perform arithmetic and logical operation with the help of arithmetic and logical instructions.
- Arithmetic instructions are addition, subtraction, multiplication and division.
- These operations are performed on signed, unsigned and floating point numbers.
- Logical operation is like comparison of two numbers. XOR shifting and rotating of numbers are also logical operations and logical instructions perform logical operation.

I/O Instructions:

- Each CPU provides instructions to read data from peripheral devices and writing data to peripheral devices.
- These instructions are used to read and write data to and from the Input/Output devices e.g. a programmer uses input and output commands e.g. input and print commands are used for these operations

Control Transfer Instructions:

- Each CPU provides instructions to control the flow of operations.
- These instructions are used to execute the instructions repeatedly and the programmer uses these instructions to transfer the control from one instruction to another e.g. jump, jumpz (jump if zero).

Q7. What is an Instruction format? Explain different types of Instructions format.

INSTRUCTION FORMAT:

- The CPU fetches the instruction from memory and decodes it and executes the instruction according to the requirement of the instructions.
- The structure of instruction is called instruction format. Each instruction has a specific format and generally it consists of:

opcode: A code for the instruction indicates the type of action and is 4-bit code

Address of the operands: These are the addresses of data locations on which CPU performs an action and each address is 6-bits.

opcode(4-bits) operand reference1(6-bits) operand reference2(6-bits)

The different address formats are:

1. Zero Address format
2. One address format
3. Two address format
4. Three address format

Zero Address format:

- It does not use any address field in the computational instruction.
- ADD and MUL instructions don't use any address field of the stack (set of memory location); however, address field is necessary for PUSH and POP instructions.

One address format:

- The instruction with one address format uses only one address field. It uses accumulator AC register for all types of data manipulation.

Two address format:

- The instruction with two address format uses two address fields. Each address field can specify a register or a memory location.
- Examples are: ADD, MOV, CMP, BIS etc.

Three address format:

- The instruction with three address format uses three address fields. Each address field can specify a register or a memory location.
- A program with arithmetic expressions produces fast and better results.
- A binary coded instruction requires too many bits to specify three addresses.
- These instruction formats consists of either three register address fields or two registers and one memory address field.

Q8. What is Fetch-Decode and Execute Cycle? Explain different steps involved in this process.

FETCH-DECODE AND EXECUTE CYCLE:

- This cycle describes the process of execution of an instruction within the computer.
- One round of steps from getting an instruction back to getting the next instruction is called the **Machine Cycle**.

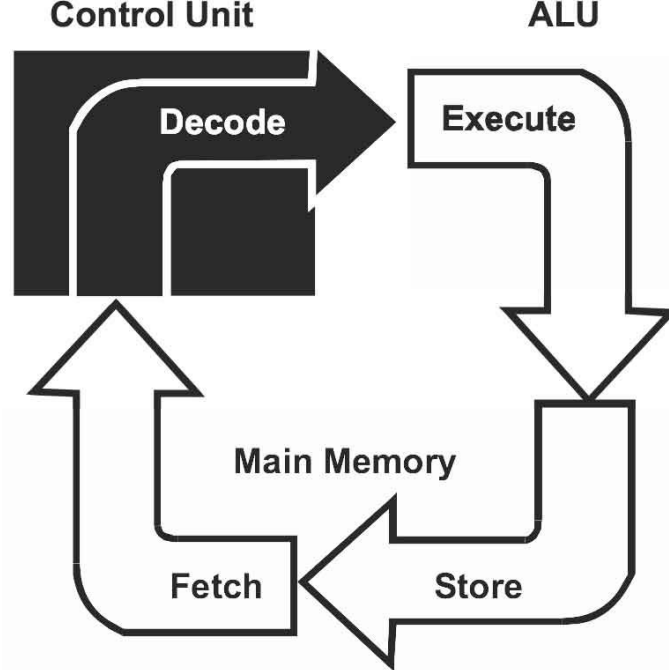
The Machine Cycle

Fetch - Get an instruction from Main Memory

Decode - Translate it into computer commands

Execute - Actually process the command

Store - Write the result to Main Memory



Fetch Instruction:

- The CPU reads the value of PC and the instruction is copied into the instruction register (IR). This process involves two following steps:
 - 1 Copy the contents of PC into MAR and the request for memory read.
 2. Copy the data from the memory to MBR and instruction is copied into IR.
- After completing the above steps the value of PC is incremented and it points to the address of next instruction.

Decode Instruction:

- Decoding means to activate the appropriate circuit to execute the instruction.
- After completing the fetch process the CU decodes the instruction by analyzing the opcode of the instruction.
- CU also reads the values of operands specified in the instruction.

Execute Instruction:

- The process of performing an action on the decoded instruction is called execution.
- After decoding the CPU executes the instruction by using the activated circuit.
- After execution the results are copied into the registers and memory.

Q9. What is an Operating system? Explain different functions of OS.

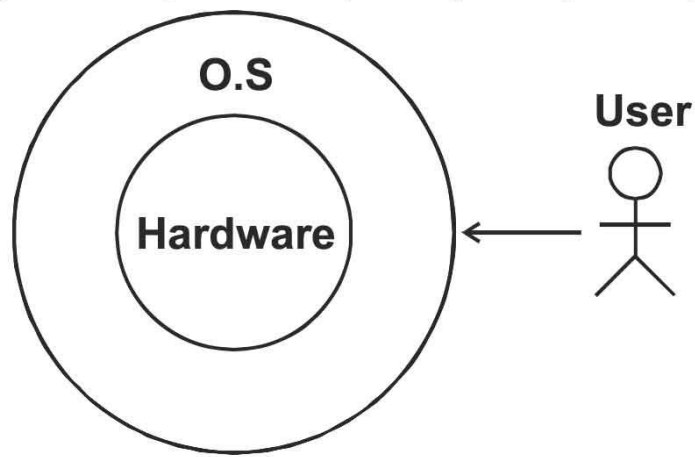
OPERATING SYSTEM:

- It is a collection of operative programs that provides an interface for the user to interact with the computer.

OR

- It is a set of programs running in the background on a computer system and providing an environment in which other programs can be executed and the computer system can be used efficiently.

- Important operating system are; windows, DOS, Unix, Linux, Solaris etc.



Functions of Operating System:

Manage Hardware Resources:

- OS must provide programs to manage the hardware resources of the computer like disk, memory and CPU.

Memory Management:

- Every program must be loaded in the computer memory during execution and if several programs are loaded simultaneously in the memory then it is the job of operating system to run each program individually.

For multi-programming time-sharing technique is used.

The operating system is responsible for the protection of data of one program from the action of other programs.

Load and Execute Programs:

- Operating system provides the facility of easily loading programs in the main memory and starts its execution.

Bootting:

- Bootting is a process of starting or restarting the computer. Operating system starts the compute to work. It checks the computer and makes it ready to work.

Data Security:

- OS must protect the user's data from an illegal access and modification.

Interface to the Users:

- It is an interface between user and computer and also between software and computer.
- There are two type of interfaces:
- Command-line interface
- Graphical user interface

Command-line interface (CLI):

- In command line interface users communicate with the system by typing commands using keyboard or
- It provides a command prompt to the users for typing commands to interact with the computer.
- Each command activates a program of the operating system.
- Examples are: MS-DOS, early versions of UNIX, Novell Netware etc.

Graphical user interface (GUI):

- A GUI operating system provides a graphical user interface to establish the user communication with the computer.
- It consists of windows, menus, icons and pointers.
- The user issues the commands by selecting different object with the help of pointing devices.
- MS-Windows 95, Windows 98, Windows XP are the examples of GUI operating system.

Q10. What are Programming Languages? Explain different Types of Programming Languages.

PROGRAMMING LANGUAGE:

- It is the way of communication between User and Computer.
- It is used to write computer programs.
- A language provides the rules to write an instruction is called its **syntax**. Each language has its own syntax.

Types of Programming Languages:

There are two types of computer languages.

1. Low Level Language
2. High Level Language

Low Level Language (LLL):

- The language which is close to machine language is called low level language.
- A Computer can easily understand low-level language.
- The low level language requires a deep understanding of the machine architecture.

There are two types of low-level language.

1. Machine language
2. Assembly language

Machine language:

- It is the native language of computer.
- The computer does not need any translator to understand it.
- Every machine language instruction consists of 0's and 1's.
- It is difficult for human beings to understand and learn it.
- It is difficult to locate and remove errors in the program.

- It is directly executed by the computer.
- The machine language programs are machine dependent.

Assembly language:

- Machine language instructions(0's and 1's) are replaced with English like words known as mnemonics (Ne-monics)
- It is also called symbolic language.
- An assembler is required to translate the assembly language programs into machine language.

High Level Language (HLL):

- It is closed to human language.
- It is user friendly language.
- User can learn and understand high level language easily.
- The instructions of HLL are written in English like statements.
- The programs of HLL are not directly executed on the computer.
- A language translator is required to translate the HLL into low level language.
- These translators are compilers and interpreters
- The programs written in HLL are machine independent.
- Each language has its own translator.
- HLL programs are easy to modify, debug and more reliable.
- The HLL does not require a deep understanding of the machine architecture.
- HLL describes a well defined way of writing programs.
- These languages are mostly used for writing application programs; Examples :
- C and C++ (used for writing System Software), Java (Java is equipped with strong Network features), COBOL (common business oriented language and used for business applications), PASCAL, FORTRAN (Formula Translation and used for mathematical problems),BASIC (Beginners all purposes symbolic instruction code)

Source Program:

- The program written in High Level Language is called source program.
- The computer does not understand the source code.
- The source code is converted into machine code and then it is directly executed on the computer.

Object Program:

- The program in a machine language is called object program.
- The computer understands the object code directly.

Q11. What are Language Translators? Discuss its different Types.

LANGUAGE PROCESSOR/TRANSLATOR:

- It is software that is used to translate the high level language programs (source code) into machine language (object code).
- Each language has its own translator. Only one type of translator is used in any language. There are three types of language processor.
 1. Compiler
 2. Interpreter
 3. Assembler



Compiler:

- The language translator translates the source code into object code and the whole program is translated at the same time.
- If a program contains errors then compiler can not convert the source code into machine code until all the errors are removed from the source program.

Interpreter:

- The language translator translates the source code into object code statement by statement.
- The working of interpreter is slower than the compiler.
- Any error in the program stops its execution. After removal of errors execution resumes.

Difference between compiler and interpreter:

- Compiler converts the whole program at a time and interpret / translate the source code instructions one by one.
- Compiler converts each instruction only once but the interpreter may translate an instruction several times.
- A compiled program runs faster than an interpreted program.

Assembler:

- The language translator translates the assembly language into machine code i.e. it produces the binary instructions for a given assembly language program.

Q.12 What is a port? Explain different types of ports.

Ans. Port:

- The peripheral devices are connected to the system unit through a special device called the port. It is an interface or connecting socket.
- It provides a standard way of communication between the computer and its input and output devices (or peripheral devices). For examples, keyboard, mouse, printer, monitor, and modem etc. are connected with the computer by plugging their connectors into ports.

Types of Ports:

There are three basic types of ports:

- Serial port.
- Parallel port.
- USB port.

Serial Ports:

- Serial ports provide connection for transmitting data one bit at a time. Serial ports are often referred to as communicating (COM) ports. The mouse, keyboard and modem are usually connected to the serial ports.

Parallel Port:

- A parallel port provides a connection for transmitting data 8-bits at a time. Therefore, it is eight times faster than serial port. The printers and scanners are connected to the parallel ports. Parallel ports are often referred to as Line Printer Ports (LPT).

USB:

- USB stands for Universal Serial Bus. It is a plug-and-play hardware interface. It is used to connect the peripherals such as keyboard, mouse, scanner, and modem etc. It allows up to 127 different peripheral devices to be connected to the computer.

EXERCISE

Q.1 Fill in the blanks:

1. DMA stands for direct memory access.
2. In full duplex transmission mode, data can be transmitted in both directions simultaneously.
3. The lexical analyzer also commonly known as control unit.
4. The control unit CU reads the instructions from the memory and decodes these instructions.
5. The Graphical user interface (GUI) consists of windows, menus, Icons and pointers.
6. EEPROM stands for electrically erasable programmable read only memory.
7. Stack pointer register is used for managing stack.
8. DRAM requires periodic electric refreshing to maintain data storage.
9. COBOL language was developed for business applications.
10. GPR (General Purpose Register) or Accumulator is used in mathematical and logical operations.
11. DVD stands for digital video disk.
12. BIOS stand for basic input output system.
13. Initial work on the internet was done in UNIX operating system.
14. The instruction that are use to transfer data from one unit to another during program execution is called data transfer instructions.
15. General Purpose Register is used in mathematical and logical operations.
16. The backbone of the computer is computer bus.
17. Typically CPU can provide between 4000 to 64000 bytes of memory on its cache.
18. A parallel port transmits multiple bits at a time.
19. In 1951, John Von Neumann and his team proposed a design of stored program computer.
20. A sequence of instructions is called a program.
21. All the data and the programs are stored in memory.
22. The machine reads all the instructions one by one and executes these instructions sequentially.
23. The organization and interconnection of various computer components is called computer architecture.
24. CPU stands for "central processing unit".
25. CPU is a small chip mounted on the circuit board (mother board).

26. CPU is the brain of computer in term of computing power and it controls all the functions of computer system.
27. CPU performs data processing.
28. CU stands for "Control Unit".
29. The Control Unit reads the instruction from memory, decodes and executes these instructions.
30. ALU stands for "Arithmetic and Logical Unit".
31. All the program instructions and data are stored in memory for the execution.
32. Memory unit temporarily stores the data and instructions.
33. Memory unit is also called working area of the computer.
34. RAM Stands for Random Access Memory.
35. ROM stands for Read Only Memory.
36. Secondary Memory is used to store data permanently in the computer for later use.
37. I/O Unit handles the processor's communication with its peripheral devices.
38. Register are the high speed memory locations built into the microprocessor. The CPU uses these locations to store data and instructions temporarily to accomplish certain operations.
39. Data is processed and transferred from one component to another with the help of registers.
40. Bus Interconnection is used to connect different parts of the computer.
41. SRAM stands for static random access memory.
42. No refreshing of electric states is required in SRAM.
43. SRAM chips are faster than DRAM.
44. SRAM uses less power than DRAM.
45. The design of SRAM is more complex than DRAM.
46. SRAM is more expensive than DRAM.
47. DRAM stands for dynamic random access memory.
48. DRAM must have an electric current to maintain its electric states.
49. ROM is referred as non-volatile, or system memory.
50. When the power is switched off, the contents of ROM is not lost.
51. PROM stands for programmable read only memory.
52. EPROM stands for erasable programmable read only memory.
53. Information can be erased using ultraviolet rays in EPROM.
54. EEPROM stands for electrically erasable programmable read only memory.
55. Cache Memory is very high speed buffer or memory used to increase the speed of processing.
56. Cache Memory is small memory between CPU and main memory whose access time is close to the processing speed of CPU.

57. Computer BUS is circuits provide a communication path between two or more devices of a digital computer.
58. A computer has more than one bus interconnection.
59. All the components of a computer are connected with a set of parallel lines. These lines are used to transfer data in the form of bits from one component to another component. These lines are called BUS.
60. The System Bus is used to connect main components of the computer.
61. There are 70-100 parallel lines in system bus.
62. The System Bus is divided into three main categories.
63. Control Bus is the lines that are used to transmit commands or control signals from one component to another.
64. MEMORY WRITE is used to write data to a given memory location.
65. MEMORY READ is used to read data from a given memory location.
66. I/O WRITE is used to write some data on output device.
67. I/O READ is used to read some data from input device.
68. BUS REQUEST is used to request a control on the bus so that the requesting device can use it to transmit data.
69. BUS GRANT is used by the bus controller to indicate the grant of the bus to a device.
70. TRANSFER ASK is used by the bus controller to indicate the grant of the bus to a device.
71. Address Bus is a part of system bus and it carries the address of various memory locations to perform read and write operations.
72. Data Bus is used to transfer the data from one component to another.
73. The amount of data that a bus can transmit is called bus-width.
74. The major components are connected to the system bus and the remaining components are connected to another bus called expansion bus and the expansion bus is connected to the system bus.
75. The I/O unit is responsible to compensate the speed difference between processor and I/O devices.
76. Interrupts are the signals generated by I/O devices. These signals inform the CPU of the occurrence of certain events such as completion of an I/O operation.
77. DMA stands for direct memory access.
78. DMA is a technique of performing an I/O operation in which I/O operation is completed without involving the CPU.
79. PC stands for Program Counter.
80. PC holds the address of the next instruction to be fetched and executed.
81. IR stands for Instruction Register.
82. IR holds the current instruction that is being executed.

83. MAR stands for Memory Address Register.
84. MAR holds the address of active memory location.
85. MBR stands for Memory Buffer Register.
86. MBR holds the contents of the memory location read from or written in the memory.
87. SP stands for Stack Pointer Register.
88. Arrangement of data is called stack and data is stored in or retrieved from stack using LIFO.
89. LIFO stands for last in first out.
90. LIFO is also known as FILO (first in last out).
91. SP register is used to manage the stack
92. EAX, EBX, ECX, EDX are 4 byte registers.
93. AX, BX, CX, and DX are 2 byte registers.
94. AH, AL, BH, BL, CH, CL, DH and DL are 1 byte registers.
95. A stands for Accumulator. It is used for arithmetic and logical operations.
96. B stands for Base register. It is used for arithmetic and data movement and special addressing abilities.
97. C stands for Counter register. It is used for counting purpose.
98. D stands for Data register. It has special role in division and multiplication.
99. Address registers are also called segment Registers.
100. CS, DS, ES, SS are segment registers.
101. The size of each segment register is 2 bytes.
102. CS stands for code segment.
103. CS holds the base location of all executable instructions in the program.
104. CS along with IP register fetches the next instruction.
105. DS stands for Data Segment.
106. DS is the default base location for memory variables.
107. DS points to data in memory using DI or SI registers.
108. CPU calculates the offset of variables using the current value of DS.
109. ES stands for Extra Segment.
110. ES is an additional base location for memory variables.
111. SS stands for Stack segment.
112. SS contains the base location of the current program stack.
113. IP stands for Instruction Pointer.
114. The set of all the instructions provided by CPU is called Instruction Set.
115. The instruction set increases the performance of a CPU.
116. Data Transfer Instructions are used to transfer data from or to the memory.
117. Arithmetic and Logical Instructions perform arithmetic and logical operation.
118. All arithmetic and logical operations are performed by ALU.

Types of RAM:

SRAM, DRAM

SRAM:

- It stands for static random access memory.
- No refreshing is required in SRAM.
- These chips are faster than DRAM.
- SRAM uses less power than DRAM.
- Its design is more complex than DRAM.
- SRAM is more expensive than DRAM.

DRAM:

- It stands for dynamic random access memory.
- It is slower than SRAM
- It requires refreshing.
- Its design is simple and is not expensive.
- **EDO-DRAM:** EDO-DRAM is an example of DRAM. It stands for Enhanced Data output Dynamic Random Access Memory. It is 50% faster than ordinary DRAM

CACHE MEMORY:



- It is very high speed memory. It is used to increase the speed of processing
- It is small memory between CPU and main memory.
- Its access time is close to the processing speed of CPU.
- It is used to store the frequently used programs and data.
- By making active programs and data available to the CPU at a rapid rate, it is possible to increase the performance of a CPU.

ROM (Read Only Memory):

- The contents of ROM are read only.
- New data cannot be written on it.
- Its contents are permanent.
- The system manufacture writes the ROM instructions and data at the time of manufacturing and the data and instructions cannot be changed afterwards.
- It is also called non-volatile, or system memory.
- When the power is switched off, the contents of ROM do not lost.
- As ROM is supplied by the manufacturer therefore it is impossible for the users to modify the stored programs in ROM.

- 141. Assembler is the language translator translates the assembly language into machine code.
- 142. A parallel port transmits multiple bits at a time.
- 143. The backbone of the computer is CPU.

Q.2 Choose the correct answer.

1. Data and programs that are not being use by computer are stored in:
(a) **Secondary storage** (b) Cache
(c) Primary storage (d) printer
2. A set of instructions that run the computer are:
(a) Hardware (b) document
(c) CPUs (d) **Software**
3. The idea of stored program was given by:
(a) Charles Babbage (b) John Leitbiz
(c) **John Von Neumann** (d) Pascal
4. Which one is the brain of computer?
(a) RAM (b) **CPU**
(c) Motherboard (d) System unit
5. Which component of a computer decodes and executes program constructions?
(a) Main memory (b) **Control unit**
(c) Bus interconnection (d) ALU
6. The component of computer that stores data and program while these are being executed is called:
(a) **Main memory** (b) Control unit
(c) Bus interconnection (d) ALU
7. The component of computer that is used to connect different parts of the computer together is called:
(a) Register (b) I/O unit
(c) **Bus interconnection** (d) CPU
8. A computer drives its basic strength from:
(a) Speed (b) Memory
(c) Accuracy (d) **All**
9. The program that contains instructions to operate a device is called:
(a) **Device driver** (b) Device Operator
(c) Device linking (d) Device system
10. Which component of CPU is responsible for performing arithmetic and logical operations on numeric data?
(a) **ALU** (b) Control unit
(c) Register (d) None

11. CPU is an example of:
- (a) Software
 - (b) Input unit
 - (c) **Hardware**
 - (d) Output unit
12. Which is a storage device?
- (a) CPU
 - (b) Clock
 - (c) **Floppy disk**
 - (d) Bus
13. Which component of computer coordinates all activities in the computer?
- (a) ALU
 - (b) **Control unit**
 - (c) Bus interconnection
 - (d) Registers
14. Which component of computer is responsible for comparison of two numbers?
- (a) **ALU**
 - (b) Control unit
 - (c) Memory
 - (d) Hard Disk
15. _____ is the component of CPU:
- (a) Main memory
 - (b) Bus interconnection
 - (c) **ALU**
 - (d) I/O unit
16. CPU includes all of the following components except?
- (a) **Main memory**
 - (b) ALU
 - (c) Control unit
 - (d) Registers
17. The cells of memory are logically organized into group of:
- (a) 4-bits
 - (b) 5-bits
 - (c) 7-bits
 - (d) **8-bits**
18. CPU is an example of:
- (a) Software
 - (b) a program
 - (c) **Hardware**
 - (d) an output unit
19. The address of instruction under the processor execution is contained within:
- (a) Program Counter
 - (b) Current Instruction Register
 - (c) **Memory address registers**
 - (d) Memory Buffer register
20. RAM is a:
- (a) Read Only Memory
 - (b) Permanent memory
 - (c) **Volatile memory**
 - (d) None
21. _____ is non-volatile memory:
- (a) RAM
 - (b) DRAM
 - (c) **ROM**
 - (d) SRAM

22. _____ chips must be refreshed with electric charge periodically?
- (a) SRAM (b) ROM
(c) EEPROM (d) **DRAM**
23. ROM is:
- (a) Read Only Memory (b) Non-volatile
(c) Volatile (d) **Both a and b**
24. _____ is a type of ROM?
- (a) PROM (b) EPROM
(c) EEPROM (d) **All**
25. _____ memories can be re-written by using electrical devices?
- (a) PROM (b) ROM
(c) **EEPROM** (d) EPROM
26. Which memory is used to increase the processing speed of computer?
- (a) RAM (b) ROM
(c) **Cache Memory** (d) SRAM
27. Files not being used by computer are stored in:
- (a) **Secondary storage** (b) Cache
(c) Primary Storage (d) Registers
28. A set of parallel electrical lines used to transfer data is called:
- (a) Monitor (b) Computer Clock
(c) I/O unit (d) **Bus**
29. The circuit board on which processor and other chips are mounted is called:
- (a) Master board (b) Main board
(c) **Motherboard** (d) All
30. The external devices that are connected to a computer are called:
- (a) Buses (b) Registers
(c) **Peripherals** (d) Slots
31. A computer derives its basic strength from:
- (a) Speed (b) Memory
(c) Accuracy (d) **ALL of the above**
32. The arithmetic and logic unit performs the following operations :
- (a) Controls Computer operations
(b) Performs arithmetic functions such as addition and subtraction etc.
(c) Performs logical comparisons such as equal, greater than, less than etc.
(d) **Both b and c**

33. How many categories the system bus is divided?
- (a) 2 (b) 3
(c) 4 (d) 5
34. Which one is not a type of bus?
- (a) **Cache** (b) Control bus
(c) Address bus (d) Data bus
35. CPU sends command signals to different components of computer through:
- (a) Data bus (b) Address bus
(c) **Control bus** (d) All
36. A bus that communicates data between CPU and memory is called:
- (a) **Data bus** (b) Address bus
(c) Control bus (d) All
37. ——— command is used to write data into memory?
- (a) I/O Write (b) Transfer Ask
(c) **Memory Write** (d) I/O Read
38. Temporary storage area within CPU is called:
- (a) **Register** (b) ALU
(c) Bus interconnection (d) Linked code
39. Which one is faster?
- (a) RAM (b) Cache
(c) **Register** (d) Hard disk
40. Which is not a type of register?
- (a) **Math coprocessor** (b) Flag
(c) Accumulator (d) Segment
41. ——— registers holds the address of the next instruction to be fetched for execution:
- (a) IR (b) **PC**
(c) MAR (d) MBR

42. _____ registers holds the instruction fetched from memory?
- (a) **IR** (b) PC
(c) MAR (d) MBR
43. Which register holds the address of active memory location that is being currently accessed by the CPU?
- (a) IR (b) PC
(c) **MAR** (d) MBR
44. Which is a storage device?
- (a) CPU (b) Clock
(c) **Floppy disk** (d) Bus
45. Which component is responsible for comparing the contents of two pieces of data:
- (a) **ALU** (b) Control Unit
(c) Memory (d) None
46. Which register holds the contents of data/instruction read from, or written in memory?
- (a) IR (b) PC
(c) MAR (d) **MBR**
47. _____ registers acts as counter for looping process?
- (a) EAX (b) EBX
(c) **ECX** (d) EDX
48. _____ registers is used for arithmetic and data operations?
- (a) **AX** (b) BX
(c) CX (d) DX
49. _____ registers holds the base location of all executable instructions in the program?
- (a) **CS** (b) DS, SS
(c) ES, FS (d) FS, GS
50. _____ registers contains the base location of the current program stack?
- (a) CS (b) DS
(c) ES (d) **SS**
51. The size of segment register is:
- (a) **2-bytes** (b) 2 KB

- (c) 2 MB (d) 2 bits
52. The program that contains instructions to operate a device is called:
- (a) **Device driver** (b) Device operator
- (c) Device linking (d) Device system
53. Which component of CPU decodes and executes the programs instructions?
- (a) Clock (b) **CU**
- (c) Cache (d) ALU
54. Which component handles the processor's communication with its peripheral devices?
- (a) **I/O Unit** (b) Hard Disk
- (c) Registers (d) CD
55. Which is not a component of a CPU?
- (a) Clock (b) Register
- (c) **Main Memory** (d) Cache
56. The basic unit for data storage is:
- (a) **Byte** (b) Bit
- (c) TB (d) GB
57. 8 Bytes is equal to:
- (a) Bit (b) 48 bits
- (c) 32 Bits (d) **64 bits**
58. The process of taking action on the decoded instruction is called:
- (a) Decode instruction (b) **Execute instruction**
- (c) Activate instruction (d) None
59. The process of decoding the instruction so that the computer can understand it is called:
- (a) **Decode instruction** (b) Execute instruction
- (c) Translate instruction (d) Fetch instruction
60. The programming languages that are close to human language are called:
- (a) **High-level** (b) Low-level

- (c) Medium-level (d) Machine
61. The programming languages that are very close to machine code are called:
(a) High-level (b) **Low-level**
(c) Medium-level (d) Machine
62. How many types of language translator?
(a) 2 (b) 4
(c) 5 (d) **3**
63. _____ is a type of language translator?
(a) Compiler (b) Assembler
(c) Interpreter (d) **All**
64. The set of parallel lines to connect to different parts of the computer is called:
(a) **Bus** (b) Memory
(c) I/O (d) ALL of the above
65. Which register is used for counting purpose?
(a) AX (b) **CX**
(c) DX (d) BX
66. Which register is known as Accumulator?
(a) **AX** (b) CX
(c) DX (d) BX
67. The program written in assembly language is translated with the help of:
(a) Compiler (b) **Assembler**
(c) Interpreter (d) Decoder
68. The translated program into machine code is called:
(a) Source program (b) **Object program**
(c) System program (d) Application software
69. The output of the compiler is called:
(a) Program (b) Source code
(c) Application (d) **Object code**
70. The special programs that are used to convert a source code into object code are called:
(a) Language translator (b) Language processor

(c) Both a and b

(d) Operating system

71. Which is not a general purpose register?

(a) EDX

(b) EAX

(c) EEX

d) EBX

72. The register that holds the current Instruction is called

(a) MBR

(b) MAR

(c) IR

(d) PC

Q.3 WRITE T FOR TRUE AND F FOR FALSE STATEMENT:

1. Bps stands for byte per second (T)
2. In Simplex Transmission mode, communication can take place in both directions. (F)
3. Random access memory is volatile memory. (T)
4. Operating system is an application program. (F)
5. External buses and internal buses are similar. (F)
6. Accumulator register is used to control the stack in the computer. (F)
7. LIFO stands for last in first off. (F)
8. Expansion slot is a place where an expansion card is fitted. (T)
9. Static RAM holds the data as long as power is supplied to it. (F)
10. The clock of the computer ticks once in one second just like an ordinary clock. (F)
11. VDU is an input device. (F)

SHORT QUESTIONS

Q.1 What is the design of John Von Neumann?

Ans. In 1951 John Von Neumann and his team proposed a design of stored program computer. According to the design:

A sequence of instructions is called a program.

All the data and the programs are stored in memory.

The machine reads all the instructions one by one and executes these instructions sequentially.

Q.2 What is Computer Architecture?

Ans. The organization and interconnection of various computer components is called computer architecture. I/O devices, CPU, Primary or Main Memory, Secondary Memory or Storage devices, I/O unit, Registers, Bus Interconnection are the components of computer architecture.

Q.3 What are I/O devices?

Ans. It stands for input and output devices. Input devices: User can communicate with the computer through input devices e.g. Keyboard, Mouse, joystick, track-ball, Microphone, camera, scanner, bar code reader etc. Output devices are used to communicate with the user e.g. Monitor, Speakers, Printers and Projectors etc.

Q.4 What is a CPU?

Ans. It stands for “central processing unit”. It is a small chip mounted on the circuit board (mother board). CPU is the brain of computer in term of computing power and it controls all the functions of computer system. CPU also performs data processing. There are two parts of a CPU. CU (Control Unit) and ALU (Arithmetic and logical unit)

Q.5 What is CU?

Ans. It stands for “Control Unit”. The CU reads the instruction from memory, decodes and executes these instructions.

Q.6 What is ALU?

Ans. It stands for “Arithmetic and Logical Unit”. It performs two types of operations on data. Arithmetic operations (addition, subtraction, multiplication and division) Logical operations (the operations produces true or false results e.g. less than, greater than, equal to not equal to etc.)

Q.7 What is the function of Main Memory?

Ans. All the program instructions and data are stored in memory prior to the execution. This unit temporarily stores the data and instructions. It is also called working area of the computer. There are two types of memory: RAM (Random Access Memory) and ROM (Read Only Memory)

Q.8 What are Secondary Storage Devices?

Ans. These devices are used to store data permanently in the computer for later use. These are CD's, Hard Disk, and Floppy Disk etc.

Q.9 What is an I/O unit?

Ans. It handles the processor's communication with its peripheral devices. These are disk drives, monitor, printer etc.

Q.10 What are Registers?

Ans. These are the high speed memory locations built into the microprocessor. The CPU uses these locations to store data and instructions temporarily to accomplish certain operations. Data is processed and transferred from one component to another with the help of registers.

Q.11 What is Bus Interconnection?

Ans. It is used to connect different parts of the computer.

Q.12 What is Main Memory?

Ans. It is a chip of semi-conductor material. Memory consists of identical cells. These cells are logically organized into a group of 8-bits (1-Byte). Each cell has a unique address to read or to write data in the memory. Data and instructions are stored in these cells in the form of bits. It is directly accessible device therefore; it is faster than other storage devices. There are two types of memory. RAM (Random Access Memory) and ROM (Read Only Memory)

Q.13 What is RAM?

Ans. RAM stands for Random Access Memory. Primary storage is usually referred as RAM. It is referred as read/write memory. It is also called volatile, or user memory. The contents of RAM are lost as the electric supply is cut-off. There are two types of RAM. SRAM, DRAM

Q.14 Define SRAM.

Ans. It stands for static random access memory. No refreshing of electric states is required in SRAM. These chips are faster than DRAM. SRAM uses less power than DRAM. Its design is more complex than DRAM. SRAM is more expensive than DRAM.

Q.15 What is DRAM?

Ans. It stands for dynamic random access memory. It must have an electric current to maintain its electric states.

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Q.16 What is a ROM?

Ans. ROM stands for Read Only Memory. New data cannot be written on it. Its contents are permanent. The system manufacture writes the ROM instructions and data at the time of manufacturing and the data and instructions cannot be changed afterwards. It is referred as non-volatile, or system memory. When the power is switched off, the contents of ROM is not lost. ROM chips are used to store frequently used programs like operating system routines.

Q.17 What are the types of ROM?

Ans. PROM, EPROM, EEPROM

Q.18 Define PROM.

Ans. It stands for programmable read only memory. It is initially blank and the manufacturer writes instructions and data with some special devices. Once the information is stored onto PROM, then it cannot be changed.

Q.19 Define EPROM.

Ans. It stands for erasable programmable read only memory. It is another type of ROM chip and it is possible to erase the stored information and the chip can be reprogrammed using special devices. Information can be erased using ultraviolet rays.

Q.20 What is EEPROM?

Ans. It stands for electrically erasable programmable read only memory. It is a kind of ROM chip can be re-written using electrical devices. The stored information on EEPROM can be erased, modified or reprogrammed easily using special devices.

Q.21 What is the role of Cache Memory in computers?

Ans. It is small memory between CPU and main memory whose access time is close to the processing speed of CPU. It is used to store segments of the current programs and data frequently used in the present calculations. By making active programs and data available to the CPU at a rapid rate, it is possible to increase the performance of a CPU.

Q.22 Define Computer BUS.

Ans. These are circuits provide a communication path between two or more devices of a digital computer. A computer has more than one bus interconnection or all the components of a computer are connected with a set of parallel lines. All these lines are used to transfer data in the form of bits from one component to another component. These lines are called BUS. There are two types of buses. System Bus and Expansion Bus

Q.23 Define System Bus.

Ans. The bus is used to connect main components of the computer. Generally there are 70-100 parallel lines in system bus. It is divided into three main categories. Control Bus, Address Bus and Data Bus

Q.24 What is a Control Bus?

Ans. These lines are used to transmit commands or control signals from one component to another. It also transmits the other control signals like ACKS (acknowledgement signal). When a CPU gives command to the memory for writing data, then the memory sends an acknowledgement signal to the CPU after successful writing of data.

Q.25 What is function of MEMORY WRITE Command?

Ans. It is used to write data to a given memory location.

Q.26 What is function of MEMORY READ Command?

Ans. It is used to read data from a given memory location

Q.27 What is function of I/O WRITE Command?

Ans. It is used to write some data on output device.

Q.28 What is function of I/O READ Command?

Ans. It is used to read some data from input device.

Q.29 What is function of BUS REQUEST Command?

Ans. It is used to request a control on the bus so that the requesting device can use it to transmit data.

Q.30 What is function of BUS GRANT Command?

Ans. It is used by the bus controller to indicate the grant of the bus to a device.

Q.31 What is function of TRANSFER ASK Command?

Ans. This command is used to request for data transfer.

Q.32 What is an Address Bus?

Ans. It is a part of system bus and it carries the address of various memory locations to perform read and write operations. A unique ID is assigned to each component connected to the system bus and it is called address of the component. When a component of a computer wants to communicate with another, it uses a few system bus lines to specify the address of destination; these lines are called address bus.

Q.33 What is Data Bus?

Ans. Data bus is used to transfer the data from one component to another. These are 32 or 64 parallel lines reserved on system bus. The amount of data that a bus can transmit is called **bus-width**. A 64-line data bus can transmits 64 bits (8-bytes) at a time. Width of data bus has direct impact on the performance of the computer.

Q.34 What is an Expansion Bus?

Ans. The major components are connected to the system bus and the remaining components are connected to another bus called expansion bus and the expansion bus is connected to the system bus. If all the components are attached with system bus then it will slow down the computer. All the components will have to wait longer to get access to the bus; therefore we use the expansion bus to solve this problem.

Q.35 What is an I/O Unit?

Ans. It handles the processor's communication with its peripheral devices. The I/O unit is responsible for controlling the different devices attached with it. It is also responsible to compensate the speed difference between processor and I/O devices. Only the I/O unit is connected to the system bus and the remaining components are attached with I/O unit. There are two ways to transfer data from peripheral devices to the CPU. Interrupts and DMA

Q.36 What are Interrupts?

Ans. Interrupts are the signals generated by I/O devices. These signals inform the CPU of the occurrence of certain events such as completion of an I/O operation. When I/O generates a signal (Interrupt) for the CPU, on sensing this signal, the CPU suspended all operations and performing the I/O operation. The disadvantage of this scheme is that it reduces the overall performance of the processor.

Q.37 What is DMA?

Ans. It stands for direct memory access. It is a technique of performing an I/O operation in which I/O operation is completed without involving the CPU. The CPU just issues an I/O command and the rest of the work is completed with the help of a special DMA module. The disadvantage DMA scheme is that it is more complex and more hardware is required.

Q.38 What is a PC register?

Ans. PC stands for Program Counter. It holds the address of the next instruction to be fetched and executed. When instruction is fetched, the value of PC is automatically incremented and it points to the address of next instruction.

Q.39 What is the function of IR?

Ans. IR stands for Instruction Register. It holds the current instruction that is being executed.

Q.40 What is the function of MAR?

Ans. MAR Stands for Memory Address Register. It holds the address of active memory location. When CPU wants to store or read data from the memory, CPU stores the required address of memory location in MAR.

Q.41 What is the function of MBR?

Ans. MBR Stands for Memory Buffer Register. It holds the contents of the memory location read from or written in the memory.

Q.42 What is role of Stack Pointer (SP) Register?

Ans. Arrangement of data is called **stack** and data is stored in or retrieved from stack using LIFO (last in first out). LIFO is also known as FILO (first in last out). PUSH and POP instructions are usually used in stack to store or retrieve the values. **SP** register is used to manage the stack and it stores the value of top of stack.

Q.43 What are General Purpose Registers?

Ans. There are four general purpose registers A, B, C and D and these are used to perform arithmetic and logical operations. EAX, EBX, ECX, EDX are 4 byte registers. AX, BX, CX, and DX are 2 byte registers. AH, AL, BH, BL, CH, CL, DH and DL are 1 byte registers. The size of these registers is from 1 to 4 bytes.

Q.44 What is an Accumulator?

Ans. Accumulator is a General purpose register. It is used for arithmetic and logical operations. It holds the initial data to be operated upon, and the final results of processing. The results of arithmetic operations are returned to accumulator for transfer to the main memory through buffer register.

Q.45 What is Base register:

Ans. It is used for arithmetic and data movement and special addressing abilities.

Q.46 What is the function of Counter register?

Ans. It is used for counting purpose. It acts as counter in loops.

Q.47 What is the function of Data register?

Ans. It has special role in division and multiplication.

Q.48 What are Address or Segment Registers?

Ans. It is a group of 4 registers CS, DS, ES and SS. Size of each segment register is 2 bytes.

Q.49 What is a function of CS (Code Segment) Register?

Ans. It holds the base location of all executable instructions in the program. CS along with IP register fetches the next instruction.

Q.50 What is a function of DS (Data Segment) Register?

Ans. It is the default base location for memory variables. DS points to data in memory using DI or SI registers. CPU calculates the offset of variables using the current value of DS.

Q.51 What is a function of ES (Extra Segment) Register?

Ans. It is an additional base location for memory variables.

Q.52 What is a function of SS (Stack segment) Register?

Ans. It contains the base location of the current program stack.

Q.53 What is a function of IP (Instruction Pointer) Register?

Ans. CS along with IP register fetches the next instruction.

Q.54 What are function of Index Registers (DI, SI)?

Ans. DS points to data in memory using DI or SI registers.

Q.55 What are the Types of Instructions?

Ans. Data Transfer Instructions

Arithmetic and Logical Instructions

I/O Instructions

Control Transfer Instructions

Q.56 What is an Instruction set?

Ans. Each CPU provides a number of instructions to perform different operations. The set of all the instructions provided by CPU is called **Instruction Set**. The instruction set increases the performance of a CPU. There are four types of instructions provided by a CPU. Data transfer instructions, Arithmetic and logical instructions, I/O instructions, Control Transfer instructions

Q.57 What are Data Transfer Instructions?

Ans. These instructions are used to transfer data from or to the memory. The professionals use these instructions to bring the data into CPU and copy data from CPU to the memory.

Q.58 What are Arithmetic and Logical Instructions?

Ans. CPU can perform arithmetic and logical operation with the help of arithmetic and logical instructions. Arithmetic instructions are addition, subtraction, multiplication and division. Logical operations involve comparison of two numbers. All arithmetic and logical operations are performed by ALU in CPU.

Q.59 What is an I/O Instructions?

Ans. Each CPU provides instructions to read data from peripheral devices and writing data to peripheral devices. These instructions are used to read and write data to

and from the Input/Output devices e.g. a programmer uses input and output commands e.g. input and print commands are used for these operations

Q.60 What is Control Transfer Instructions?

Ans. Each CPU provides instructions to control the flow of operations. These instructions are used to execute the instructions repeatedly and the programmer uses these instructions to transfer the control or control flow operations e.g. jump, jumpz (jump if zero).

Q.61 What is an Instruction Format?

Ans. The CPU fetches the instruction from memory and decodes it and executes the instruction according to the requirement of the instructions. Each instruction has a specific format and generally it consists of:

opcode:

A code for the instruction indicates the type of action and is 4-bit code

Address of the operands:

These are the addresses of data locations on which CPU performs an action and each address is 6-bits.

opcode(4-bits) operand reference1(6-bits) operand reference2(6-bits)

The different address formats are: Zero Address format, one address format, two address formats and three address formats.

Q.62 What is Zero Address format?

Ans. It does not use any address field in the computational instruction. ADD and MUL instructions don't use any address field of the stack (set of memory location); however, address field is necessary for PUSH and POP instructions.

Q.63 What is one address format?

Ans. The instruction with one address format uses only one address field. It uses accumulator AC register for all types of data manipulation.

Q.64 What is Two address format?

Ans. The instruction with two address format uses two address fields. Each address field can specify a register or a memory location. Examples are: ADD, MOV, CPM, BIS etc.

Q.65 What is Three address format?

Ans. The instruction with three address format uses three address fields. Each address field can specify a register or a memory location. A program with arithmetic expressions produces fast and better results. A binary coded instruction requires too many bits to specify three addresses. These instructions formats consists of either three register address fields or two registers and one memory address field.

Q.66 What is a Fetch-Decode and Execute Cycle?

Ans. This cycle describes the process of an execution of an instruction within the computer. CPU performs three steps. Fetches Instruction, Decodes Instruction, and Executes Instruction.

Q.67 What Fetch Instruction process:

Ans. The CPU reads the value of PC and the instruction is copied into the instruction register (IR). This process involves two steps:

Copy the contents of PC into MAR and the request for memory read.

Copy the data from the memory to MBR and instruction is copied into IR.

After completing the above steps the value of PC is incremented and it points to the address of next instruction.

Q.68 What is Decoding of an Instruction?

Ans. Decoding means to activate the appropriate circuit to execute the instruction. After completing the fetch process the CU decodes the instruction by analyzing the opcode of the instruction. CU also reads the values of operands specified in the instruction.

Q.69 What is an Operating System?

Ans. It is a set of programs running in the background on a computer system and providing an environment in which other programs can be executed and the computer system can be used efficiently or it is a collection of operative programs that provides an interface for the user to interact with the computer.

Q.70 What are the Functions of Operating System?

Ans. Manage Hardware Resources, Memory Management, Load and Execute Programs, Data Security, Interface to the Users

Q.71 What is Command-line interface (CLI)?

Ans. In command line interface users communicate with the system by typing commands using keyboard. Each command activates a program of the operating system. Examples are: MS-DOS, early versions of UNIX, Novell Netware etc.

Q.72 What is Graphical user interface (GUI)?

Ans. A GUI operating system provides a graphical user interface to establish the user communication with the computer. It consists of windows, menus, icons and pointers. The user issues the commands by selecting different object with the help of pointing devices. MS-Windows 95, Windows 98, Windows XP are the examples of GUI operating system.

Q.73 What is a Programming Language?

Ans. It is the way of communication between User and Computer. It is used to write computer programs. There are two types of computer languages. Low Level Language and High Level Language

Q.74 What is a Low Level Language (LLL)?

Ans. The language which is close to machine language is called low level language. A Computer can easily understand low level language. The low level language requires a deep understanding of the machine architecture. There are two types of low level language. Machine language and Assembly language

Q.75 What is a Machine language?

Ans. It is the native language of computer. The computer does not need any translator to understand it. Every machine language instruction consists of 0's and 1's. It is difficult to locate and remove errors in the program. It is directly executed by the computer. The machine language programs are machine dependent.

Q.76 What is an Assembly language?

Ans. Machine language instructions (0's and 1's) are replaced with English like words known as mnemonics (Ne-monics). It is also called symbolic language. An assembler is required to translate the assembly language programs into machine language.

Q.77 What is High Level Language (HLL)?

Ans. It is closed to human language. It is user friendly language. The instructions of HLL are written in English statements. The programs of HLL are not directly executed on the computer. A language translator (compiler or Interpreter) is required to translate the HLL into low level language. These languages are mostly used for writing application programs e.g. C and C++, Java, COBOL, PASCAL, FORTRAN, BASIC

Q.78 What is a Source Program?

Ans. The program written in High Level Language is called source program. The computer does not understand the source code. The source code is converted into machine code and then it is directly executed on the computer.

Q.79 What is an Object Program?

Ans. The program in a machine language is called object program. The computer understands the object code directly.

Q.80 What is Language Processor/Translator?

Ans. It is software that is used to translate the high level language programs (source code) into machine language (object code). Each language has its own translator. Only one type of translator is used in any language. There are three types of language processor. Compiler, Interpreter, Assembler

Q.81 Define a Compiler.

Ans. The language translator translates the source code into object code and the whole program is translated at the same time. If a program contains errors then compiler can not convert the source code into machine code until all the errors are removed from the source program.

Q.82 Define an Interpreter.

Ans. The language translator translates the source code into object code statement by statement. The working of interpreter is slower than the compiler. Any error in the program stops execution after removal of errors execution resumes.

Q.83 Differentiate between compiler and interpreter.

Ans. Compiler converts the whole program at a time and interpret / translate the source code instructions one by one. Compiler converts each instruction only once but the interpreter may translate an instruction several times. A compiled program runs faster than an interpreted program.

Q.84 What is an Assembler?

Ans. The language translator translates the assembly language into machine code i.e. it produces the binary instructions for a given assembly language program.

Q.85 What are PROGRAMMING ERRORS/Bugs?

Ans. The errors in a program are called BUGS. The process of finding and removing these errors is called debugging. There are three types of errors. Syntax Errors, Run Time Errors and Logical Errors.

Q.86 What is a Syntax?

Ans. A language provides the rules to write an instruction is called its syntax. Each language has its own syntax.