COMPUTER APPLICATION

(Code: BET-104)

(MODEL QUESTION)

Full Marks: 80   Time : 3 Hours

Answer any Five Questions including Q No. 1& 2

Figures in the right hand margin indicates marks

1	a) Define array.	2 x 10
	b) List out the major resources of a computer managed by operating system.	
	c) Write about GUI.	
	d) Write the full form of VLSI.	
	e) What is CPS and PPM?	
	f) Differentiate between software and hardware.	
	g) Differentiate between Algorithm and Flow Chart.	
	h) Compare between RAM and ROM.	
	i) Define URL with example	
	j) What is difference between structure and union?	
2	a) Make a comparison between Compiler and Interpreter.	5x 6
	b) What is software? Describe various types of software.	
	c) Draw the flowchart to find the sum of the first *N* natural numbers.	
	d) Explain different types of file access method.	
	e) Write a C program to check a number is prime or not.	
	f) Explain various mode data transmission based on direction of data flow.	
	g) Briefly explain different types of area network.	
3	Explain the hierarchy of memory present in computer in detail.	10
4	Define operating system. Discuss various types of operating system	10
5	Define network topology. Explain different types of topologies present in the network.	10
6	a) Write a C program to compute the factorial of a number.	5
	b) Compare advantages and disadvantages between 3rd and 4th generation of computer.	5
7	Write short notes on (*any two*) a) Router b) Virus c) Central Processing Unit	5 x 2

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Model Answer

Ques tion No.	Answer in Brief (salient points to be mentioned & Points to be evaluated)	Break up of Marks
1	a) Arrays a kind of data structure that can store a fixed-size sequential collection of elements of the same type. An array is used to store a collection of data, but it is often more useful to think of an array as a collection of variables of the same type. b) Resources managed by OS include the central processing unit (CPU), computer memory, file storage, input/output devices, and network connections. c) A graphical user interface (GUI) is a human-computer interface that uses windows, icons and menus and which can be manipulated by a mouse. d) VLSI - Very Large Scale Integration e) CPS is the abbreviation of characters per second, a unit of measure used to describe the speed of dot-matrix and daisy-wheel printers. The speed of laser and ink-jet printers is described in terms of pages per minute (PPM). f) Hardware refers to the physical elements of a computer or electronic system. Software refers to a collection of instructions that tells the computer how to perform a task. g) An algorithm is a step-by-step analysis of the process, while a flowchart explains the steps of a program in a graphical way. h) RAM is the memory available for the operating system, programs and processes to use when the computer is running, whereas ROM is the memory that comes with your computer that is pre-written to hold the instructions for booting-up the computer. ROM can hold data without power and RAM cannot. i) URL is an acronym for Uniform Resource Locator and is a reference (an address) to a resource on the Internet. Example: https://www.google.com j) The one major difference that distinguishes structure and union is that the structure has a separate memory location for each of its members whereas, the members of a union share the same memory location.	2 x 10
2	a) Make a comparison between Compiler and Interpreter.	5

BASIS	COMPILER	INTERPRETER
Input	It takes an entire program at a time.	It takes a single line of code or instruction at a time.
Output	It generates intermediate object code.	It does not produce any intermediate object code.
Working mechanism	The compilation is done before execution	Compilation and execution take place simultaneously.

Speed	Comparatively faster	Slower
Memory	Memory requirement is more due to the creation of object code.	It requires less memory as it does not create intermediate object code.
Errors	Display all errors after compilation, all at the same time.	Displays error of each line one by one

b) A software is a program which helps the human user to give instruction to computer hardware.

Types of Software

• Systems software

• Application software

System Software can be broadly classified into two types as:

• System control programs

• System support programs

• System development programs

System control programs

• controls the execution of programs

• manage the storage & processing resources of the computer

• perform other management & monitoring function.

The most important of these programs is the operating system, DBMS & communication monitors.

System support programs

• Provide routine service functions to the other computer programs & computer

users: E.g. Utilities, libraries, performance monitors & job accounting.
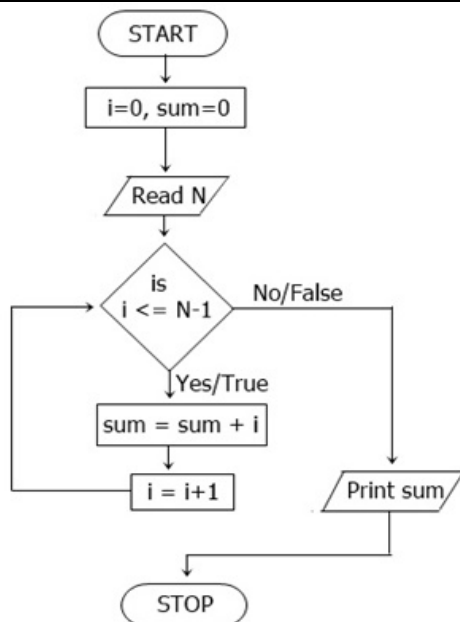
System development programs

• Assists in the creation of application

• Programs. e.g., language translators such as BASIC interpreter & application generators.

Application software

These are programs that help users solve particular computing problems.

c) Flowchart to find the sum of the first *N* natural numbers.

1+2+2

5

5

d) Different types of file access method:

There are three ways to access a file into a computer system: Sequential-Access, Direct Access, Index sequential Method.

Sequential Access

- Data is accessed one record right after another record in an order.
- When we use read command, it move ahead pointer by one
- When we use write command, it will allocate memory and move the pointer to the end of the file
- Such a method is reasonable for tape.

Direct Access

Another method is direct access method also known as relative access method. A filed-length logical record that allows the program to read and write record rapidly. in no particular order. The direct access is based on the disk model of a file since disk allows random access to any file block. For direct access, the file is viewed as a numbered sequence of block or record.

Index sequential method

It is the other method of accessing a file which is built on the top of the direct access method. These methods construct an index for the file. The index, like an index in the back of a book, contains the pointer to the various blocks. To find a record in the file, we first search the index and then by the help of pointer we access the file directly.

5

e) Write a C program to check a number is prime or not.

```c
void main()
{   int n, i, flag = 0;
    printf("Enter a positive integer: ");
    scanf("%d", &n);
    for(i = 2; i <= n/2; ++i)
    {        if(n%i == 0)
```

```
        {  flag = 1;
            break;  }  }
     if (n == 1)
     {   printf("1 is neither a prime nor a composite number."); }
     else
     {  if (flag == 0)
         printf("%d is a prime number.", n);
       else
         printf("%d is not a prime number.", n); }}
```

5

f) Various mode data transmission based on direction of data flow:

Network devices use three transmission modes (methods) to exchange data each other as follows:

- simplex
- half duplex
- full duplex.

Simplex mode is a one-way-only transmission, which means that data can flow only in one direction from the sending device to the receiving device.

Half-duplex mode limits data transmission because each device must take turns using the line. Therefore, data can flow from A to B and from B to A, but not at the same time.

Full-duplex mode accommodates two-way simultaneous transmission, which means that both sides can send and receive at the same time. In full-duplex mode, data can flow from A to B and B to A at the same time.
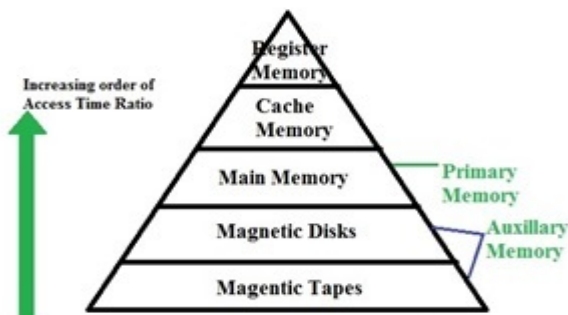
5

g) Different types of area network:

- Personal area network
- Local Area Network
- Campus Area Network
- Metropolitan Area Network
- Wide Area Network
- Global Area Network

4+6

3

The memory in a computer can be divided into five hierarchies based on the speed as well as use.

Primary Memory

The primary memory is also known as internal memory, and this is accessible by the processor directly. This memory includes main, cache, as well as CPU registers.

Secondary Memory

The secondary memory is also known as external memory, and this is accessible by the processor through an input/output module. This memory includes an optical disk, magnetic disk, and magnetic tape.

Characteristics of Memory Hierarchy

Capacity:

It is the global volume of information the memory can store. As we move from top to bottom in the Hierarchy, the capacity increases.

Access Time:

It is the time interval between the read/write request and the availability of the data. As we move from top to bottom in the Hierarchy, the access time increases.

Performance:

The enhancement is made in the form of Memory Hierarchy Design because of which the performance of the system increases.

Cost per Bit:

As we move from bottom to top in the Hierarchy, the cost per bit increases i.e. Internal Memory is costlier than External Memory.

An operating system (OS) is software that manages computer hardware resources and provides common services for computer programs. The operating system is an essential component of the system software in a computer system. Application programs usually require an operating system to function.

Types of Operating System:

1. Real-time operating system

A real-time operating system is a multitasking operating system that aims at executing real-time applications. The main objective of real-time operating systems is their quick and predictable response to events. They have an event-driven or timesharing design and often aspects of both. An event-driven system switches between tasks based on their priorities or external events while time-sharing operating systems switch tasks based on clock interrupts.

2. Multi-user operating system

A multi-user operating system allows multiple users to access a computer system at the same time. Time-sharing systems and Internet servers can be classified as multi-user systems as they enable multiple-user access to a computer through the sharing of time. Single-user operating systems have only one user but may allow multiple programs to run at the same time.

3. Multi-tasking and single-tasking Operating System

A multi-tasking operating system allows more than one program to be running at the same time,

from the point of view of human time scales. A single-tasking system has only one running program.

4. Distributed Operating system

A distributed operating system manages a group of independent computers and makes them appear to be a single computer. Distributed computations are carried out on more than one machine. When computers in a group work in cooperation, they make a distributed system.

5. Batch Processing

Batch processing is the execution of a series of programs ("jobs") on a computer without manual intervention. Jobs are set up so they can be run to completion without human interaction A program takes a set of data files as input, processes the data, and produces a set of output data files.

6. Multiprogramming

Multiprogramming is a rudimentary form of parallel processing in which several programs are run at the same time on a uniprocessor. Since there is only one processor, there can be no true simultaneous execution of different programs. Instead, the operating system executes part of one program, then part of another, and so on. To the user it appears that all programs are executing at the same time.

7. Time Sharing OS

In computing, time-sharing is the sharing of a computing resource among many users by means of multiprogramming and multi-tasking.

A topology is a network's virtual shape or structure. This shape does not necessarily correspond to the actual physical layout of the devices on the network. Network topologies are categorized into the following basic types:

1. Bus Topology

Bus networks use a common backbone to connect all devices. A single cable, the backbone functions as a shared communication medium that devices attach or tap into with an interface connector. Ethernet bus topologies are relatively easy to install and don't require much cabling compared to the alternatives. 10Base-2 and 10Base-5 both were popular Ethernet cabling for bus topologies. However, bus networks work best with a limited number of devices. If the backbone cable fails, the entire network effectively becomes unusable.
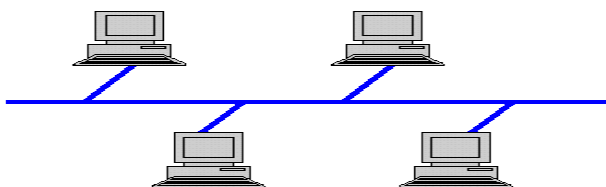
2. Ring Topology

In a ring network, every device has exactly two neighbors for communication purposes. All messages travel through a ring in the same direction (either "clockwise" or "counterclockwise"). A failure in any cable or device breaks the loop and can take down the entire network. To implement a ring network, one typically uses FDDI, SONET, or Token Ring technology. Ring topologies are

found in some office buildings or school campuses.
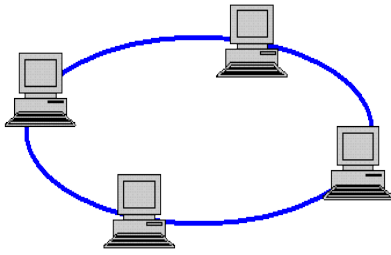
3. Star Topology

Many home networks use the star topology. A star network features a central connection point called a "hub" that may be a hub, switch or router. Devices typically connect to the hub with Unshielded Twisted Pair (UTP) Ethernet. Compared to the bus topology, a star network generally requires more cable, but a failure in any star network cable will only take down one computer's network access and not the entire LAN.

5+5
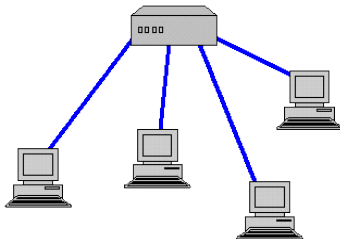
4. Tree Topology

Tree topologies integrate multiple star topologies together onto a bus. In its simplest form, only hub devices connect directly to the tree bus, and each hub functions as the "root" of a tree of devices.
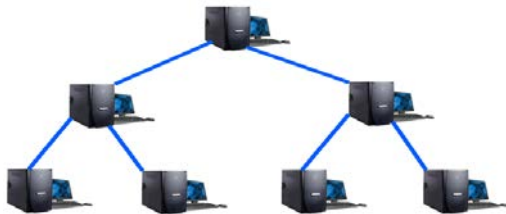
5. Mesh Topology

Mesh topologies involve the concept of routes. Unlike each of the previous topologies, messages sent on a mesh network can take any of several possible paths from source to destination. A mesh network in which every device connects to every other is called a full mesh.

5
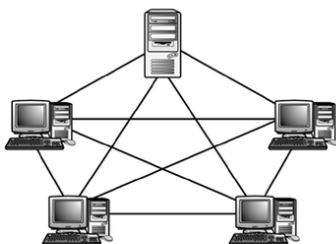
6	a) C program to compute the factorial of a number:	

```
void main()
{   int c, n, fact = 1;
  printf("Enter a number to calculate its factorial\n");
 scanf("%d", &n);
  for (c = 1; c <= n; c++)
   fact = fact * c;
  printf("Factorial of %d = %d\n", n, fact);
  }
```

2.5+2.5

b) **Third Generation Computers:**

Advantages:

- These computers were cheaper as compared to second-generation computers.
- They were fast and reliable.
- Use of IC in the computer provides the small size of the computer.
- IC not only reduce the size of the computer but it also improves the performance of the computer as compared to previous computers.
- This generation of computers has big storage capacity.
- Instead of punch cards, mouse and keyboard are used for input.
- They used an operating system for better resource management and used the concept of time-sharing and multiple programming.
- These computers reduce the computational time from microseconds to nanoseconds.

Disadvantages:

- IC chips are difficult to maintain.
- The highly sophisticated technology required for the manufacturing of IC chips.
- Air conditioning is required.

Fourth Generation Computers:

Advantages:

- Fastest in computation and size get reduced as compared to the previous generation of computer.
- Heat generated is negligible.
- Small in size as compared to previous generation computers.
- Less maintenance is required.
- All types of high-level language can be used in this type of computers.

Disadvantages:

- The Microprocessor design and fabrication are very complex.
- Air conditioning is required in many cases due to the presence of ICs.
- Advance technology is required to make the ICs.

5 x 2

7	a) **Router:**	
	Routers are communication devices used to connect two different networks. A router sorts incoming data and distributes it to the correct destination. For example, if there is a network within a single office building, many different devices from within the network may access resources outside the network. The best example of this would be the Internet. A router ensures that requests from within the network for information over the Internet are distributed to the correct computer within the network.	

Routers can be used for wired connection, wireless connections or both. A router that provides a wireless connection is referred to as a 'wireless router.'
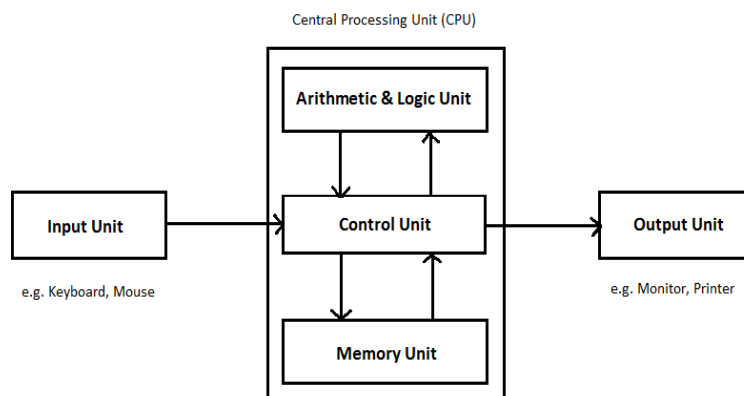
b) **Virus:**

A computer virus is a malware program that, when executed, replicates by inserting copies of itself (possibly modified) into other computer programs, data files, or the boot sector of the hard drive. When this replication succeeds, the affected areas are then said to be "infected". Viruses often perform some type of harmful activity on infected hosts, such as stealing hard disk space or CPU time, accessing private information, corrupting data, displaying political or humorous messages on the user's screen, spamming their contacts, or logging their keystrokes. However, not all viruses carry a destructive payload or attempt to hide themselves—the defining characteristic of viruses is that they are self replicating computer programs which install themselves without the user's consent.

c) **Central Processing Unit:**

CPU is considered as the brain of the computer.

- CPU performs all types of data processing operations.
- It stores data, intermediate results, and instructions (program).
- It controls the operation of all parts of the computer.

Central Processing Unit (CPU)

Arithmetic & Logic Unit

Input Unit → Control Unit → Output Unit

e.g. Keyboard, Mouse

e.g. Monitor, Printer

Memory Unit

CPU itself has following three components.

i. Memory or Storage Unit
ii. Control Unit
iii. ALU (Arithmetic Logic Unit)

Memory or Storage Unit

This unit can store instructions, data, and intermediate results. This unit supplies information to other units of the computer when needed. It is also known as internal storage unit or the main

memory or the primary storage or Random Access Memory (RAM).

Control Unit:

This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations.

ALU (Arithmetic Logic Unit):

This unit consists of two subsections namely,

- Arithmetic Section
- Logic Section

Arithmetic Section

Function of arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication, and division. All complex operations are done by making repetitive use of the above operations.

Logic Section

Function of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.

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