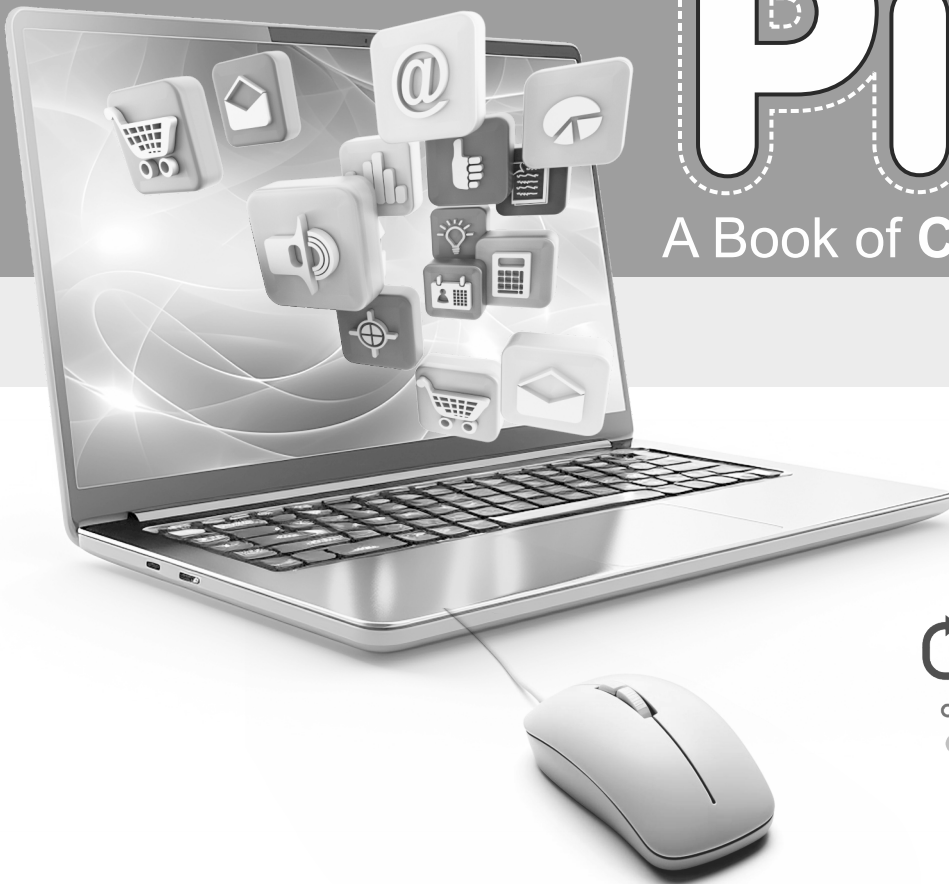




Pixel

A Book of Computer Science



1. Computer Memory

Assessment Zone

- A.** 1. (b) 2. (b) 3. (a) 4. (a) 5. (c)
- B.** 1. F 2. T 3. T 4. F 5. F
- C.** 1. bits, bytes 2. nibble 3. Saving
4. Magnetoresistive 5. memory modules
- D.** 1. A computer processes and store data and instructions in the form of two digits, 0 and 1. These digits are called the binary digits or bits.
2. Memory module usually consists of one or more chips on the motherboard or you can say it consists of electronic components that store instructions waiting to be executed by the processor.
3. Programmable Read Only Memory, Erasable Programmable ROM and Electrically EPROM.
- E.** 1. Memory is classified into two types : Primary Memory and Secondary Memory.
(i) **Primary Memory** : Primary memory is often known as the working memory or the main memory of a computer system. Primary memory is of two types—volatile and non-volatile. When the computer power is turned off, volatile memory loses its contents. Non-volatile memory (NVM), in contrast, does not lose its contents when the computer is turned off.
(ii) **Secondary memory** : Secondary memory is used to store data for a long time. It operates at a slower rate than primary memory. This memory is permanent in nature, i.e. data stored is not lost even when the computer is switched off. So, it is known as non-volatile memory.
2. The three common types of RAM are : Dynamic RAM, STATIC RAM and Magnetoresistive RAM.
Dynamic RAM (DRAM) is inexpensive and the most popular type of main memory used in computers. Many variants of DRAM chips exist, most of which are faster than the basic DRAM.
Static RAM (SRAM) is efficient and fast, but is very expensive. SRAM is used in small amounts as cache memory in a computer. Cache memory improves the performance of a computer by storing the data which the computer frequently uses.
Magnetoresistive RAM (MRAM) is a newer type of RAM which stores data using magnetic charges instead of electrical charges. Its manufacturers claim that it has greater storage capacity, consumes less power and has faster access time than other RAMs.
- F.** Cache Memory as it improves the processing speed of the computer. □

2. Computer Virus

Assessment Zone

- A.** 1. (c) 2. (a) 3. (c) 4. (a) 5. (a)
- B.** 1. T 2. F 3. T 4. T 5. T
- C.** 1. Payload 2. E-mail 3. Trojan Horse
4. virus signature 5. Rague
- D.** 1. Computer viruses are programs which are created deliberately to damage critical information and data.
2. Antivirus program detects the changes that the virus causes in computer.
3. A virus signature, also called a virus definition, is a known specific pattern of virus code.
- E.** 1. Boot sector virus attaches itself to the boot sector of the disk. This sector is the part of the disk where start-up instructions and the file-allocation tables are kept. This sector is read and loaded into the memory every time the disk is booted.
2. E-mail viruses are spread by files attached to e-mail messages. You cannot get an e-mail virus from a message that contains only text. When you open an e-mail attachment that contains a virus, the virus spreads to your computer.
3. Ransomware is a virus that restricts access to your computer system and demands a ransom (money) to be paid in order to remove the restriction.
4. (i) Install an antivirus program on your computer. Update the software and the virus signature files regularly. (ii) Always download software and files from trusted websites.
- F.** A virus entered in my computer. □

3. Excel : Creating Worksheet

Assessment Zone

- A.** 1. (b) 2. (a) 3. (c) 4. (b) 5. (c)
6. (b)
- B.** 1. F 2. F 3. T 4. T 5. T
6. T
- C.** 1. 1048576, 16384 2. letter, number
3. Undo 4. Merge & Center
5. Borders

- D.**
1. A spreadsheet file is called a workbook.
 2. The collection of rows and columns is called worksheet.
 3. Moving Data allows us to reorganise data in a worksheet.
 4. Copying data allows us to repeat data in a worksheet without having to retype it.
- E.**
1. Microsoft Excel is a powerful spreadsheet program that allows us to organize and maintain data, complete calculations and represent data in graphs.
 2. The default row height and column width in Excel is 14.40 points and 8.11 characters.
 3. We need to select cells in Excel to perform tasks like Editing, Calculating and Formatting.
 4. We can format a worksheet to make it more presentable and attractive.
 5. Border is used to separate specific data from the surrounding cells.
- F.**
1. The important features of Excel are :
 - (i) Microsoft Excel is best known for manipulating numeric data.
 - (ii) Excel allows us to share our data with other users.
 - (iii) We can also use Microsoft Excel for organizing data. The row and column format of an Excel spreadsheet is perfect for entering many types of data you need to track.
 2. Alignment means the way in which the data is set within the boundary of a cell. By default, Excel automatically aligns text data to the left and number data to the right. The different alignment buttons are : Align Left, Center, Align Right, Top Align, Middle Align, Bottom Align.
 3. Conditional formatting is used to apply formatting on some specific cells that meet the specified condition. To remove conditional formatting :
 - (i) Select the cells from where you want to remove the conditional formatting.
 - (ii) Click on the Home tab.
 - (iii) Click on Conditional Formatting.
 - (iv) Choose Clear Rules.
 - (v) Click on Clear Rules from Selected Cells from the side menu.The conditional formatting gets removed.
- G.** Using Insert Sheet Rows option.



4. Excel : Functions and Charts

Assessment Zone

- A.** 1. (b) 2. (b) 3. (a) 4. (b) 5. (b)
6. (b)
- B.** 1. T 2. T 3. T 4. F 5. T
6. T
- C.** 1. Constant, Formulas 2. Formula
3. Parentheses () 4. Absolute
5. objects 6. Sparklines
- D.** 1. Formula is a sequence of values, cell reference or operators.
Function is a built-in formula which is used to perform a calculation.
2. Absolute Referencing is used to make cell reference constant while copying formulas.
Relative Referencing is used to modify cell reference automatically while copying formulas in other cells.
- E.** 1. Operators are symbols which are used to indicate a type of calculation.
2. SUM(), AVERAGE(), MAX(), MIN()
3. Every cell in a worksheet has a unique address, also called cell reference.
4. Sparklines are tiny, word-sized charts that can appear in a cell.
- F.** 1. When a formula contains more than one operator, Excel performs the calculations in a specific order according to precedence. The order in which Excel performs operations in formulas is called order of calculation. You can use parentheses () to change the order in which Excel performs calculations. Excel performs the calculation inside the parentheses first.
2. To edit a formula :
(i) Double-click on the cell containing the formula you want to change. (or press F2)
The formula appears in the cell.
Excel outlines each cell used in the formula with a different color.
(ii) Press the Arrow key to move the insertion point to where you want to remove or add characters.
(iii) To add data where the insertion point flashes on your screen, type the data. To delete the data where insertion point flashes, use Backspace or Delete key.
(iv) When you finish making changes to the formula, press the Enter key.

3. **Bar Chart** : Bar chart can be represented in a tabular format as well as in the pattern of columns. This chart shows data changes over a period of time and comparisons with some specific or individual items.

Line Chart : Line chart displays continuous data over the time, set against a common scale and is, therefore, ideal for showing trends in data at equal intervals.

Area Chart : It displays the magnitude of change over time. It also shows the relationship of parts to a whole by displaying the sum of a plotted value.

Pie Chart : This chart has a shape of round pie cut into slices. It displays the contribution of each value to a total value (represented by overall pie).

4. Charts are graphical representations of the data. Excel offers a wide selection of charts, which help you to display your data in a pictorial way. There are over a dozen chart types, each with several sub-types, provided by Excel.

Advantages of Charts

- (i) Charts display a lot of information in an easy to understand format.
- (ii) Data and information can be presented in an attractive manner with the help of a chart.
- (iii) A chart is more impressive and informative as compared to a simple data statement.

G. 1,52,250.



5. Pencil2D : Animation Software

Assessment Zone

- A.** 1. (c) 2. (c) 3. (b) 4. (a)
- B.** 1. T 2. F 3. F 4. T 5. T
- C.** 1. bitmap, vector 2. stage 3. rectangle
4. Playhead 5. Paint Bucket
- D.** 1. It is located below the stage. It contains the keyframes and layers that make up an animation.
2. The Tools Palette on the left is used to draw and point on the stage.
- E.** 1. Frames enable us to control what appears in animation sequences.
2. Onion skin is used to see several keyframes at once.
3. Bitmap layer, Vector layer, Sound layer and Camera layer.

- F. 1. Pencil2D is a free and open source 2D animation/drawing application software. It lets us create traditional hand-drawn graphics as well as animation (cartoon) using both bitmap and vector graphics.
2. Animation is a series of still images displayed in a quick sequence.
- G. He use clear Frame Tool.

6. Google Apps

Assessment Zone

- A. 1. (b) 2. (c) 3. (b) 4. (c) 5. (a)
6. (a)
- B. 1. T 2. F 3. T 4. T 5. F
6. F
- C. 1. Larry Page, Sergey Brin 2. Gmail
3. Google Calendar 4. classroom
5. Google Drive 6. Google Nest
- D. 1. Google Apps are completely based on cloud computing which means storing and accessing data and programs over the Internet.
2. Google Maps use GPS to search the current location of a user, or to recommend nearby places of interest.
3. Google Classroom enables teaches to create an online classroom, invite students to the class create and distribute assignments etc.
4. Google Android is an operating system for mobile computing devices.
5. Google Nest Cam is a battery-powered, weather proof security camera that helps you stay informed about the surroundings.
- E. 1. Google (www.google.com) is an American public corporation, specializing in Internet-related services and products. It is founded in January 1996 by Larry Page and Sergey Brin, two Ph.D. students at Stanford University.
2. Google Translate is a free online language translation service which instantly translates text into other languages. The Google Translate app for mobile lets you instantly translate printed text visually. Just open the app, click on the camera and point it at the text you need to translate—a street sign, ingredient list, instruction manual, etc.
3. Google Drive is an online storage that provides you 15 GB of free Google online storage, in which you can keep files, folders, backups and everything important. Users can upgrade their free 15 GB account through a paid subscription plan to get additional storage.
- F. Google Nest.

7. Internet : Services and Technologies

Assessment Zone

- A.** 1. (a) 2. (c) 3. (b) 4. (a)
- B.** 1. T 2. F 3. T 4. T 5. T
- C.** 1. avatars 2. Microsoft 3. Wi-fi 4. Amazon 5. e-commerce
- D.** 1. Blogging is an exciting and dynamic medium by which we can publish our ideas, opinions and stories online.
2. The blockchain is a secure ledger database shared by all parties participating in a network of computers.
3. Cortana is a personal digital assistant developed by Microsoft.
4. Video conferencing is used to do live meeting between two peoples who are separated geographically.
- E.** 1. Wireless Internet Access (Wi-Fi) wireless network in computer systems which enables connection to the Internet or other devices that have Wi-Fi functionalities. Wi-Fi networks broadcast radio waves that can be picked up by Wi-Fi receivers that are attached to different devices.
2. Internet of things (IoT) is the network of things that are connected together and pass useful information to each other with the help of Internet. It connects electronic devices such as refrigerators and ACs to the Internet, sensors and uses software to connect them to our daily lives. Users can access the data or control individual objects using the related web or mobile apps.
- F.** By providing hotspot connection.



8. Cloud Computing

Assessment Zone

- A.** 1. (a) 2. (c) 3. (c) 4. (c)
- B.** 1. T 2. T 3. T 4. F 5. F
- C.** 1. Hybrid 2. Pay-As-You-Go 3. Google Drive
4. Trash 5. Sign out

- D.** 1. IaaS provides IT infrastructure like servers, storage, network operating system over the Internet on ‘pay as you go’ basis. It is the most flexible cloud computing model and allows companies to scale storage, processing power or bandwidth, up or down as needed.
2. SaaS is a method for delivering software applications over the Internet, on demand and typically, on a subscription basis.
3. PaaS provides a cloud platform and allows developers to create, test and run their program, website, web app, etc. without having to purchase the hardware and software.
- E.** 1. Cloud computing is a technology that provides resources and services over the Internet.
2. Service providers provide Internet Related Services to the Users.
3. Google Drive is a cloud storage service developed by Google in which we can store our files online and access them anywhere in the whole world.
- F.** 1. The reasons for choosing cloud computing are :
- Accessibility :** Data and applications are available worldwide from any computer or device with an Internet connection.
- Cost Saving :** The expense of buying software and high-end hardware shifts away from the user.
- Space Saving :** Floor space required for servers and other hardware shifts away from the user.
- Scalability :** It provides the flexibility to increase or decrease computing requirement as per the need.
2. The important characteristics of cloud computing are :
- ◆ It is probably the most cost-efficient method to use, maintain and upgrade. It eliminates the capital expense of buying hardware and software and other infrastructure.
 - ◆ It allows users to get large storage capacity for storing data and information.
 - ◆ It allows users to access files on the Internet from any computer or device that has Internet access.
 - ◆ Users can allow others to access their files on the Internet such as listening to an audio file, watching a video clip or viewing a photo instead of sending the file to them via an email message.
 - ◆ It makes data backup easier and less expensive.
- G.** Using Google Drive, she can easily share the project with her teacher online.



9. Python : Introduction

Assessment Zone

- A.** 1. (a) 2. (b) 3. (b) 4. (c)
- B.** 1. T 2. F 3. T 4. T 5. F
- C.** 1. F5 2. Keywords 3. Literals 4. indentation
5. statement
- D.** 1. A Token is a smallest element of a program that is meaningful to the interpreter.
2. Operators are the special symbols that carry out arithmetic and logical computations.
3. Comments are used to explain Python code and make it more readable.
- E.** 1. Python was developed by Guido Van Rossum in 1991.
2. A random name made out of letters, digits and/or underscore (`_`) to identify a function name, a program name or a memory location (variable or constant) is known as identifier.
3. Variables are used to store data in the memory. The data can be numbers, text and/or objects.
4. A python program is made up of one or more physical lines. Each physical line may end with a comment. The text written in the comments are ignored by python. Python uses indentation to express the block structure of a program. An indentation is an empty space at the beginning of block of code.
- F.** 1. Data type is used to define the type of value a data can contain. It represents what kind of operation can be done on a particular data. Data types define the way to store values in the memory.

Integer

Integers are the whole numbers consisting of + or – sign without decimal point such as 1000, – 88, etc.

Example: `>>> a = 12 # This is a positive integer value`
 `>>> b = -20 # This is a negative integer value`

Float

Float data type represents floating point numbers which contain decimal point. For example, 0.5, -4.567, 0.001, etc.

Example: `>>> a = 12.5 # This is a float value`
 `>>> b = 12 # This is an integer value`

String

String is a sequence of characters (alphabets, numbers, operators and punctuation) used to store and represent text-based information.

Single quotes (' ') and double quotes (" ") are used to represent strings in Python.

Example:

```
>>> name = "seema" # name stores a string
>>> password = 'seema@123'
```

2. The input() and print() functions are used for standard input and output operations in Python. An input() function is used to get input from user. The print() function is used to print the value of given input value or string. It helps to show output on screen.

G. Using int() function.



10. Fields of Artificial Intelligence

Assessment Zone

- A.** 1. (b) 2. (c) 3. (a) 4. (a) 5. (a)
- B.** 1. F. 2. T 3. T 4. T 5. F
- C.** 1. ANI 2. Robotics 3. strategic 4. obstacles
5. Machine learning 6. Deep learning
- D.** 1. ASI refers to the ability of an AI system that could perform any task better than humans with cognitive behaviour.
2. F.E.A.R. and Tic-Tac-Toe.
3. The term AI ethics refers to a set of rules which employ widely accepted standards of right and wrong to guide moral conduct in the development of Artificial Intelligence technologies.
4. Privacy Violations and Discriminations.
- E.** 1. Gaming industry uses AI technology to improve the strategic aspects of games. The main objective of AI in games is to generate responsive, adaptive or intelligent behaviour primarily in non-player characters (NPCs) similar to human-like intelligence.
2. With ASI, a system would become so self-aware that it would surpass the level of cognitive performance and decision-making skills found in humans.
- F.** Artificial General Intelligence.



Half-Yearly Model Test Paper

- A.** 1. (a) 2. (a) 3. (b) 4. (b) 5. (c)
6. (b) 7. (c)
- B.** 1. T 2. F 3. F 4. T 5. T
6. T 7. F
- C.** 1. 1 2. 1024 3. Gigabytes 4. 1024
- D.** 1. SDRAM 2. Primary and Secondary Memory
3. Worm 4. Constant and formulas 5. equal to (=)
6. bitmap and vector 7. Stage
- E.** 1. **Worm** : Worm is a harmless virus that simply replicates itself. But in the long run, it takes over all the resources of the computer system and eventually the computer becomes useless. Worms have the capacity to travel from system to system very easily.
2. **Cell range** : A group of related cells in a worksheet is called a cell range.
3. **Dynamic RAM** : Dynamic RAM (DRAM) is inexpensive and the most popular type of main memory used in computers. Many variants of DRAM chips exist, most of which are faster than the basic DRAM.
4. **Cache Memory** : Cache is a temporary storage data for instructions and data that enhances the CPU speed. Most of the today's computers improve their processing time with cache memory.
5. **Workbook** : A spreadsheet file is called a workbook, which is like a notebook having many individual worksheets.
6. **Range** : A cell is selected (active) when a dark border surrounds it, and the active cell reference displays it in the Name box on the left side of the Formula bar. Selected cells are highlighted on your screen. Selected group of cells is also called a Range.
7. **Layers** : Layers are used to organize the artwork in your document. There are four types of layers available in Pencil2D—Bitmap Layer, Vector Layer, Sound Layer and Camera Layer.
8. **Frames** : Frames are the little rectangles on the Timeline. They enable you to control what appears in animation sequences. Length of time in an animation is divided into frames.
- F.** 1. 1 Byte (B) = 1 character
1 Kilobyte (KB) = 1024 Bytes (about 1 thousand characters)
1 Megabyte (MB) = 1024 Kilobytes (about 1 million characters)
1 Gigabyte (GB) = 1024 Megabytes (about 1 billion characters)
1 Terabyte (TB) = 1024 Gigabytes (about 1 trillion characters)
1 Petabyte (PB) = 1024 Terabytes (about 1 quadrillion characters)

- 1 Exabyte (EB) = 1024 Petabytes (about 1 quintillion characters)
 - 1 Zettabyte (ZB) = 1024 Exabytes (about 1 sextillion characters)
 - 1 Yottabytes (YB) = 1024 Zettabytes (about 1 septillion characters)
 - 1 Brontobyte (BB) = 1024 Yottabytes (about 1 octillion characters)
2. Magnetoresistive RAM (MRAM) is a newer type of RAM which stores data using magnetic charges instead of electrical charges. Its manufacturers claim that it has greater storage capacity, consumes less power and has faster access time than other RAMs. MRAM retains its contents even after the computer is switched off, which could prevent loss of data for users.
 3. Different variations of ROM are :
 - (i) A Programmable Read-Only Memory (PROM) chip is a blank ROM chip on which you can place items permanently. Programmers use microcode instructions to program a PROM chip.
 - (ii) An Erasable Programmable ROM (EPROM) is another type of ROM, the contents of which are erased by ultraviolet light and then it can be reprogrammed.
 - (iii) An Electrically EPROM (EEPROM) is another variation of the PROM chip, which allows a programmer to erase the microcode with an electrical signal and can be reprogrammed.
 4. Malware (short for malicious software) is a term used for computer viruses, worms, trojan horses and rootkits. It is a program that acts without a user's knowledge and deliberately alters the computer operations.
 5. **Features of Antivirus**
 - ◆ Most antivirus programs contain an automatic update feature that regularly prompts the users to download the updated virus signatures, at least once a week.
 - ◆ Most antivirus programs automatically check for viruses when they are first installed. In addition, many antivirus programs automatically scan files downloaded from the web, e-mail attachments, opened files and all types of removable media inserted in the computer or mobile device.
 6. While working in Excel, you must save your workbook to reuse it or share it with others. Saved file can be used on other computers also. By default, Excel workbooks are saved in the Excel file format which uses the .xlsx file extension.
 7. When a formula contains more than one operator, Excel performs the calculations in a specific order according to precedence. The order in which Excel performs operations in formulas is called order of calculation. You can use parentheses () to change the order in which

Excel performs calculations. Excel performs the calculation inside the parentheses first.

For example, if you want to determine the average of values in A3, B3 and C3 and you enter the equation $=A3+B3+C3/3$, you will receive the wrong answer. This is because Excel divides the value in cell C3 by 3 first and then adds that result to A3+B3. Following operator precedence, division takes precedence over addition. The correct way to determine the average formula is $=(A3+B3+C3)/3$. Enclosing the values in parentheses. Excel adds the cell values first before dividing the sum by 3.

8. Absolute Reference

While copying formulas, if Excel does not change cell reference and makes it constant, at that time, Excel uses absolute cell referencing. To specify an absolute cell reference in a formula, enter a dollar sign (\$) before any column letter and row number that you want to keep constant in formulas you plan to copy.

For example, \$C\$5 is an absolute cell reference. A formula using the absolute cell reference \$C\$5 instructs Excel to keep the cell reference C5 constant (absolute) in the formula as it copies it to the destination area.

9. Advantages of Charts

- (i) Charts display a lot of information in an easy to understand format.
- (ii) Data and information can be presented in an attractive manner with the help of a chart.
- (iii) A chart is more impressive and informative as compared to a simple data statement.

10. Components of Chart

The main components of a chart are given below :

X-axis	Y-axis	Data Series	Data Object
Chart Area	Plot Area	Chart Title	Axis Title
Gridlines	Legend	Data Label	

11. Onion skin is used to see several key frames at once.



Annual Model Test Paper

-
- A.** 1. (a) 2. (a) 3. (a) 4. (b) 5. (c)
6. (c) 7. (b) 8. (a)
- B.** 1. F 2. F 3. T 4. T 5. T
6. F 7. F 8. T 9. F

- C. 1. Google Calendar 2. Microsoft 3. meta and universe
 4. Google Drive 5. sign out 6. statement 7. Robotics
 8. Obstacles
- D. 1. **Google Pixel** : Google Pixel is an Android smartphone designed and marketed by Google. It includes all your favorite Google apps to bring you a fast, seamless and easy-to-use experience.
2. **Google Play** : Google Play is a store of apps (applications), songs, books, movies, games and other content for Android-powered smartphones, tablets and other devices. It is a huge virtual store and offers a lot of content to its users, either free of charge or at a cost.
3. **PaaS** : PaaS provides a cloud platform and allows developers to create, test and run their program, website, web app, etc. without having to purchase the hardware and software.
4. **SaaS** : SaaS is a method for delivering software applications over the Internet, on demand and typically, on a subscription basis.
5. **Blockchain** : The blockchain is a secure ledger database shared by all parties participating in a network of computers.
6. **Comments** : Comments are used to explain Python code and make it more readable.
7. **Data Types** : Data type is used to define the type of value a data can contain. It represents what kind of operation can be done on a particular data. Data types define the way to store values in the memory.
8. **Token** : A Token is a smallest element of a program that is meaningful to the interpreter.
9. **Neural Network** : Neural network is a set of algorithm design based on the structure of human brain to recognize patterns and classify different types of information.
- E. 1. Google Drive is an online storage that provides you 15 GB of free Google online storage, in which you can keep files, folders, backups and everything important. Users can upgrade their free 15 GB account through a paid subscription plan to get additional storage.
2. Google Translate is a free online language translation service which instantly translates text into other languages.
 The Google Translate app for mobile lets you instantly translate printed text visually. Just open the app, click on the camera and point it at the text you need to translate—a street sign, ingredient list, instruction manual, etc.
3. Blogging is an exciting and dynamic medium by which we can publish your ideas, opinions and stories online.
4. A hotspot is a wireless network that provides Internet connections to mobile computers and devices.

5. Video conferencing is used to do live meeting between two peoples who are seperated geographically.
6. A search engine is a program that finds websites, web pages, images, videos, news, maps and other information related to a specific topic. Some popular search engines are :

(i) Google	(ii) Bing	(iii) Yahoo!
(iv) Yandex	(v) DuckDuckGo	(vi) Baidu
(vii) Ask.com	(viii) Naver	(ix) Ecosia
(x) AOL	(xi) Internet Archive	
7. Using cloud computing, an organization can run its applications on a shared data center.

Characteristics of cloud computing are :

(a) On demand self service	(b) Pay per use
(c) Resource pooling	
8. The input() and print() functions are used for standard input and output operations in Python. An input() function is used to get input from user.

The print() function is used to print the value of given input value or string. It helps to show output on screen.
9. A random name made out of letters, digits and/or underscore (_) to identify a function name, a program name or a memory location (variable or constant) is known as identifier.
10. Variables are used to store data in the memory. The data can be numbers, text and/or objects.
11. Gaming industry uses AI technology to improve the strategic aspects of games. The main objective of AI in games is to generate responsive, adaptive or intelligent behaviour primarily in non-player characters (NPCs) similar to human-like intelligence.

12. **Deep Learning**

Deep learning is the subset of machine learning which itself is a subset of AI. It is a function of Artificial Intelligence that imitates the workings of the human brain in processing data and creating patterns for making decisions. To achieve this, deep learning uses a multi-layered structure of algorithms called neural networks. For example, self-driving cars use neural network to find the obstacles or lane lines.

Machine Learning

Machine learning is a subset of AI that enables systems to learn automatically from experience or past information. It focuses on the development of computer programs that can access data and use them to learn by themselves. For example, auto-complete suggestion feature in search engines gives better result with more experience and data. □