Emerging Trends

PART 1
Objective Questions

• Multiple Choice Questions

1. Which of the following is not a emerging trend in technology?

(a) Sensors (b) Smart cities
(c) Blockchains (d) Fax machines

Ans. (*d*) Fax machines is not a recent technology and has been in use for quite a long time for sending documents using telephone network.

2. Which of the following is not a service in cloud computing?

(a) IaaS (b) SaaS
(c) PaaS (d) NaaS

Ans. (*d*) IaaS, SaaS , PaaS are all services available in cloud computing .

3. Which of the following is/are type(s) of grid computing?

(a) Data grid (b) Collaborative grid
(c) Both (a) and (b) (d) None of these

Ans. (*c*) There are three types of grid computing as
(i) Data grid
(ii) Collaborative grid
(iii) Computational grid

4. IaaS stands for

(a) Indian Administration Service
(b) Intenet as a Service
(c) Infrastructure as a Service
(d) Information as a Service

Ans. (*c*) IaaS stands for Infrastructure as a Service, a type of service in cloud computing.

5. Which of the following function(s) is/are possible by a robot?

(a) Helping in daily activities
(b) Helping in computation
(c) Helping in industries
(d) All of the above

Ans. (*d*) All the functions listed in the options are possible by the robots.

6. NLP stands for

(a) Natural Language Processing
(b) New Language Processing
(c) New Logical Program
(d) Natural Looking Program

Ans. (*a*) It is the ability of a computer program to understand human language as it is spoken and written -referred to as natural language. It is a component of artificial intelligence.

7. In grid computing, a grid is

(a) a modem
(b) a router
(c) any network device
(d) a computer

Ans. (*d*) Grid computing is a group of network computers which work together as a virtual super computer to perform large tasks.

8. Which of the following is/are an advantage(s) of blockchain technology?

(a) It allows smart devices to speak to each other better and faste.
(b) It provides durability.
(c) It provides reliability.
(d) All of the above

Ans. (*d*) The blockchain technology provides durability, reliability and longevity with decentralised network and it allows smart devices to speak to each other better and faster.

9. AR stands for

(a) All Reality
(b) Artificial Reality
(c) Augmented Reality
(d) Artistic Reality

Ans. (*c*) AR is a sub-version of immersive experiences, standing for Augmented Reality.

10. Mohan found that he could search for a product in a shopping site using voice search. This is an instance of

(a) Natural language processing
(b) Immersive experience
(c) Grid computing
(d) Block chain technology

Ans. (*a*) Predictive typing , speech recognition etc., are all applications of natural language processing , that help human beings make their searching process comfortable and faster.

11. …… uses a system of distributed computing to process large tasks using multiple nodes in a network.

(a) Grid computing (b) Cloud computing

(c) Block chain technology (d) None of these

Ans. (*a*) Grid computing is a group of networked computers which work together as a virtual supercomputer to perform large tasks, such as analysing huge sets of data or weather modeling.

12. Which of the following is not a characteristic of Big Data?

(a) Volume (b) Velocity

(c) Variety (d) Variable

Ans. (*d*) The five characteristics of big data are : Volume, Velocity, Variety ,Veracity and Value. The term Big Data refers to all the data that accumulates from different data sources. This data is not only of enormous volume but also grows rapidly, is of large varieties and contains data of rich value.

13. Which among the following makes transactions more safer?

(a) Grid computing

(b) Block Chains

(c) Virtual reality

(d) Augmented reality

Ans. (*b*) Blockchain technology is most simply defined as a decentralized, distributed ledger that records the provenance of a digital asset. By inherent design, the data on a blockchain is unable to be modified, which makes it a legitimate disruptor for industries like payments, cybersecurity and healthcare.

14. Mohini found that while looking at a thriller movie the environment around her was changing , giving her a feel of as if she was in the Movie. This is done using

(a) Natural Language Processing

(b) Immersive Experience

(c) Robotics

(d) None of the above

Ans. (*b*) An immersive experience pulls a person into a new or augmented reality, enhancing everyday life (by making it more engaging or satisfying) via technology. They often use one or more technologies linked together.

15. The different types of GRIDS in Grid computing are

(a) Data Grid

(b) Computational Grid

(c) Collaborative Grid

(d) All of the aboave

Ans. (*d*) Grid Computing can be defined as a network of computers working together to perform a task that would rather be difficult for a single machine. Types of Grid computing are : Data Grid,Computational Grid and Collaborative Grid.

• Case Based MCQs

Direction *Read the case and answer the following questions.*

16. Mr. Jack as Mechanical Engineer is not very conversant with the emerging technologies of today. He wants to be clear about some of the terms that he gets to hear here and there everyday . Help him with the correct options to be clear about the terms.

(i) A kind of technology, where human like machines are built with injected technology to help people in different tasks .

(a) Cloud computing (b) VoIP

(c) Blockchains (d) Robotics

(ii) He heard that some cities are smart, what is meant by a smart city?

(a) A city with smart people

(b) A city with smart cars

(c) A city built with smart infrastructure that can communicate to a central controlling location

(d) A city with robots

(iii) He found that when he types anything in Google search , the suggestions arrive in the list .This is an instance of

(a) robotics

(b) blockchain technology

(c) natural language processing

(d) All of the above

(iv) He found a new movie in the town that gives feelings and puts the audience in the situation of the movie. This is an instance of

(a) immersive experience (b) robotic technology

(c) NLP (d) None of these

(v) He wanted to know that which senses are used in virtual reality?

(a) Sight and Touch (b) Sight and Sound

(c) Sight and Smell (d) None of these

Ans. (i) (*d*) Robotics is an emerging technology, where human resembling machines are built with embedded knowledge and intelligence to perform and assist in human activities.

(ii) (*c*) In general, a smart city is a city that uses technology to provide services and solve city problems.

(iii) (*c*) Autolist of suggestions appearing in Google search is an instance of natural language processing.

(iv) (*a*) An immersive experience is one that pulls a person into a new or augmented reality.

(v) (*b*) Virtual reality is primarily experienced through two of the five senses Sight and Sound.

A smart city uses Information and Communication Technology (ICT) to improve operational efficiency, share information with the public and provide a better quality of government service and citizen welfare. People are able to live and work within the city, using its resources.

17. Ms. Paramita a Research Scholar at Calcutta University has got a new project on Robot development. She is not very conversant about robots and robotics. Help her by solving the questions regarding robots to make her concepts clear.

(i) Which of the following is not true about robots?
(a) They have life
(b) They work on artificial intelligence
(c) They can have visual features also
(d) Both (b) and (c)

(ii) Which of the following is/are type(s) of robots?
(a) Humanoids (b) Pre-programmed
(c) Tele-operated (d) All of these

(iii) Which of the following branch is not a part of robotics?
(a) Computer engineering (b) Mechanical engineering
(c) Electrical engineering (d) Chemical engineering

(iv) Which of the following statement(s) concerning the implementation of robotic systems is/are correct?
(a) Implementation of robots can save existing jobs.
(b) Implementation of robots can create new jobs.
(c) Robotics could prevent a business from closing.
(d) All of the above

(v) A robot is
(a) programmable (b) non-programmable
(c) Both (a) and (b) (d) None of these

Ans. (i) (*a*) Robots are devices engineered by human beings . They do no have life.
(ii) (*d*) Robots can be Humanoids look like humans , Pre-programmed or Tele-operated by telephone.
(iii) (*d*) Robot development is based on Computer, Mechanical and Electrical engineering principles.
(iv) (*d*) Robotics can save existing jobs , create jobs and help businesses to develop from adverse situations.
(v) (*a*) Since robots are human designed, comprising of intelligence , electronic boards and programs , they are programmable.

PART 2
Subjective Questions

• Short Answer Type Questions

1. List some of the cloud-based services that you are using at present. **(NCERT)**

Ans. (i) **IaaS** cloud-based services, pay-as-you-go for services such as storage, networking and virtualisation.
(ii) **PaaS** hardware and software tools available over the Internet.
(iii) **SaaS** software that's available *via* a third-party over the Internet.

2. Write full forms of the following
(i) VR (ii) AR (iii) AI (iv) IoT

Ans. (i) VR – Virtual Reality
(ii) AR – Augmented Reality
(iii) AI – Artificial Intelligence
(iv) IoT – Internet of Things

3. Write a short note on NLP.

Ans. NLP stands for Natural Language Processing . It is one of the emerging trends. In natural language processing, human language is separated into fragments so that the grammatical structure of sentences and the meaning of words can be analysed and understood in context. This helps computers read and understand spoken or written text in the same way as humans.

4. What do you understand by IoT? Write some of its applications. **(NCERT)**

Ans. Internet of Things (IoT) is a phenomenon that connects the things (the smart devices) to the internet over wired or wireless connections.

Some of its potential applications are as follows
(i) **Home appliance** Some examples of home appliances are fridges, cookers, coffee makers, heaters, HVAC, TVs, DVD players, lights, doors, windows etc.
(ii) **Wearables** Some examples of wearbles are clothes, shoes, hats, watches, heart monitors etc.
(iii) **Vehicles** Some examples of vehicles are cars, buses, bicycles, trains etc.
(iv) **Factories** Some examples of factories are machines, robots, warehouse shelves, parts within machines, tools etc.
(v) **Agriculture** Bio-chip transponders on farm animals and plants, farm humidity and temperature sensors etc.
(vi) **Food** Sensors for monitoring the condition of food.

5. Write a short note on cloud computing. **(NCERT)**

Ans. Cloud computing is internet-based computing, whereby shared resources, software and information are provided to computers and other devices on demand, like the electricity grid.

A basic definition of cloud computing is the use of the Internet for the tasks you perform on your computer for storage, retrieval and access. The "cloud" represents the Internet. Cloud computing services are delivered through a network, usually the Internet.

6. What are sensors used for? Write its types.

Ans. People use sensors to measure temperature, gauge distance, detect smoke, regulate pressure and a myriad of other uses. Because analog signals are continuous, they can account for the slightest change in the physical variable (such as temperature or pressure).

The most frequently used different types of sensors are classified based on the quantities such as Electric current or Potential or Magnetic or Radio sensors, Humidity sensor, Fluid velocity or Flow sensors, Pressure sensors, Thermal or Heat or Temperature sensors, Proximity sensors, Optical sensors.

7. What is on-demand service? How it is provided in cloud computing? **(NCERT)**

Ans. On-demand computing is an enterprise-level model of technology by which a customer can purchase cloud services as and when needed.

For example, if a customer needs to utilise additional servers for the duration of a project, they can do so and then drop back to the previous level after the project is completed.

On-demand self service refers to the service provided by cloud computing vendors that enables the provision of cloud resources on demand whenever they are required. In on-demand self service,the user accesses cloud services through an online control panel.

8. How IoT and WoT are related? **(NCERT)**

Ans. **Internet of Things** (**IOT**) allows us to interact with different devices through Internet with the help of smartphones or computers. But to interact with 'n' number of different devices, we need to install 'n' different apps.

Web of Things (**WoT**) allows the use of web services to connect anything in the physical world, besides human identities on web.

IoT along with WoT helps to create smart homes, smart offices, smart cities and so on.

9. What are the types of immersive experience?

Ans. There are two types of immersive experiences, which are as follows

(i) One being when you are actually in a physical environment.

(ii) The other type of experience is where you are shown around a real or imagined environment *via* desktop, tablet, mobile or *via* VR (Virtual Reality) headset.

10. Write some uses of Virtual Reality.

Ans. There are some uses of Virtual Reality, which are as follows

(i) In military

(ii) In sport

(iii) In mental Health

(iv) In medical Training

(v) In education

(vi) In fashion

11. List some of the applications of Augmented Reality.

Ans. There are few applications of Augmented Reality, which are as follows

(i) **In Surgery** Augmented Reality and the healthcare industry seem like the perfect match. Complicated medical procedures could be massively improved using AR technology.

(ii) **In Engineering** Production and manufacturing have been disrupted by innovative technology.

Augmented Reality has provided another tool for the creation and maintenance of complicated and expensive machines, making it easier for engineers to carry out repairs.

(iii) **In Military** Despite seeming like a relatively new application of Augmented Reality, the first fully functioning. AR system was developed at the US Air Force Research Laboratory back in 1992.

12. What are the disadvantages of smart city?

Ans. There are some disadvantages of smart city as

(i) Lack of public awareness and social responsibility.

(ii) Building and maintaining the infrastructure is costly and challenging.

(iii) Demands 24×7 connectivity and power supply.

(iv) Security issues in terms of public data.

(v) May lead a way towards social discrimination.

13. How are robots helpful in our daily life and industries?

Ans. They are used routinely to carry out many tasks that people don't want to do because such jobs are boring, dirty or dangerous. Robots can also be programmed to carry out some tasks that are too complex for humans. Robots most obviously impact everyday life in the service capacity. In households, robots, like cooking bots, lawn-mower and vacuum bots ease jobs.

Industrial robots have helped to boost productivity, safety and time savings. Robots are able to produce incredibly accurate, consistent and high quality work without needing breaks or holidays off. Industrial robots also help to remove workers from the hazardous environments and back breaking labor.

• Long Answer Type Questions

14. Explain the term big data. Also, explain its characteristics.

Ans. The generation of data sets of enormous volume and complexity called Big Data. Big data is a term that describes the large volume of data – both structured and unstructured – that inundates a business on a day-to-day basis. Big data can be analysed for insights that lead to better decisions and strategic business moves**.**

The characteristics of big data are as follows

(i) **Volume** The most prominent characteristic of big data is its enormous size. If a particular data set is of such large size that it is difficult to process it with traditional DBMS tools, it can be termed as big data.

(ii) **Velocity** It represents the rate at which the data under consideration is being generated and stored. Big data has an exponentially higher rate of generation than traditional data sets.

(iii) **Variety** It asserts that a data set has varied data, such as structured, semi-structured and unstructured data. Some examples are text, images, videos, web pages and so on.

(iv) **Veracity** Big data can be sometimes inconsistent, biased, and noisy or there can be abnormality in the data or issues with the data collection methods. Veracity refers to the trustworthiness of the data because processing such incorrect data can give wrong results or mislead the interpretations.

(iv) **Value** Big data is not only just a big pile of data, but also possess to have hidden patterns and useful knowledge which can be of high business value.

15. Explain cloud computing in detail and also specifying its types.

Ans. Cloud computing is the delivery of computing services including servers, storage, databases, networking, software,

analytics, and intelligence over the Internet to offer faster innovation, flexible resources and economies of scale. You typically pay only for cloud services you use, helping lower your operating costs, run your infrastructure more efficiently and scale as your business needs change.

There are three types of cloud deployments categorized based on an organization's ability to manage and secure assets as follows

(i) **Public Cloud** It is managed by third party which provides cloud services over the Internet to public. They offer solutions for minimizing IT infrastructure costs and act as a good option for handling peak loads on the local infrastructure. A public cloud is meant to serve multiple users, not a single customer.

(ii) **Private Cloud** It is distributed system that works on a private infrastructure and providing the users with dynamic provisioning of computing resources.

(iii) **Hybrid Cloud** It is a heterogeneous distributed system resulted by combining facilities of public cloud and private cloud. For this reason, they are also called heterogeneous clouds.

16. Explain artificial intelligence along with their applications.

Ans. Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision.

The intelligence demonstrated by machines is known as artificial intelligence. Artificial intelligence has grown to be very popular in today's world. It is the simulation of natural intelligence in machines that are programmed to learn and mimic the actions of humans.

These machines are able to learn with experience and perform human-like tasks. As technologies such as AI continue to grow, they will have a great impact on our quality of life. It's natural but everyone today wants to connect with AI technology somehow, may it be as an end-user or pursuing a career in artificial intelligence.

Some applications of artificial intelligence are as follows

(i) **Administration** AI systems are helping with the routine, day-to-day administrative tasks to minimise human errors and maximise efficiency. Transcriptions of medical notes through NLP and helps structure patient information to make it easier for doctors to read it.

(ii) **Telemedicine** For non-emergency situations, patients can reach out to a hospital's AI system to analyse their symptoms, input their vital signs and assess if there's a need for medical attention. This reduces the workload of medical professionals by bringing only crucial cases to them.

(iii) **Assisted Diagnosis** Through computer vision and convolutional neural networks, AI is now capable of reading MRI scans to check for tumours and other malignant growths, at an exponentially faster pace than radiologists can, with a considerably lower margin of error.

(iv) **Robot-assisted Surgery** Robotic surgeries have a very minuscule margin-of-error and can consistently perform surgeries round-the-clock without getting exhausted. Since they operate with such a high degree of accuracy, they are less invasive than traditional methods, which potentially reduces the time patients spend in the hospital recovering.

(v) **Vital Stats Monitoring** A person's state of health is an ongoing process, depending on the varying levels of their respective vitals stats. With wearable devices achieving mass-market popularity now, this data is not available on tap, just waiting to be analysed to deliver actionable insights. Since vital signs have the potential to predict health fluctuations even before the patient is aware, there are a lot of live-saving applications here.

17. What is Machine Learning?

Ans. **Machine Learning (ML)** is a type of Artificial Intelligence (AI) that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so.

Machine learning algorithms use historical data as input to predict new output values.

Recommendation engines are a common use case for machine learning. Other popular uses include fraud detection, spam filtering, malware threat detection, business process automation (BPA) and predictive maintenance.

Machine learning is important because it gives enterprises a view of trends in customer behavior and business operational patterns, as well as supports the development of new products. Many of today's leading companies, such as Facebook, Google and Uber, make machine learning a central part of their operations. Machine learning has become a significant competitive differentiator for many companies.

Classical machine learning is often categorised by how an algorithm learns to become more accurate in its predictions.

There are four basic approaches

(i) Supervised learing

(ii) Unsupervised learing

(iii) Semi-supervised learning

(iv) Reinforcement learing

18. Differentiate cloud computing and grid computing.

Ans. Differences between cloud computing and grid computing are

Cloud computing	Grid computing
Cloud computing follows client-server computing architecture.	Grid computing follows a distributed computing architecture.
Scalability is high.	Scalability is normal.
Cloud computing is more flexible than grid computing.	Grid computing is less flexible than cloud computing.
Cloud operates as a centralised management system.	Grid operates as a decentralised management system.

19. Write in short on how Grid computing can help process jobs better. Also compare the advantages and disadvantages of it.

Ans. The major benefit of computer grids over single supercomputers lies in their flexibility and computing

power. Using a computer grid for large amounts of data is more efficient than doing so on a single, memory-hungry supercomputer. It is also more reliable due to reduced downtime risks and is considerably less expensive.

Grid computing is a data processing choice for large companies and academic institutes. It is efficient, affordable and fast while delivering high levels of accuracy and data integrity. Computer grids can involve risks, but, as mentioned earlier, check and balance measures can greatly mitigate them.

In short, computer grids are one of the most attractive and cost-effective means of getting massive computing loads processed. And it's an area of computing technology that is growing fast as data loads increase exponentially across many industries.

Advantages of Grid Computing

(i) They are not that expensive.
(ii) They are quite efficient and reliable machines and can solve complex problem in limited time.
(iii) They are scalable.
(iv) Grid Computing follows distributed computing architecture.
(v) Grid Computing is application oriented.
(vi) They work in a decentralized management system.
(vii) They can use existing hardware.
(viii) Can easily associate with other organization.
(ix) Tasks and instructions can be performed in parallel speeding.
(x) Grid computing works in a group if any one of the computer is unavailable the workload is distributed across the remaining computers.
(xi) The grid computing can be upgrade on the fly without scheduling downtime.

Disadvantages of Grid Computing

(i) They are not interactive for job submissions.
(ii) Grid system is not fully evolved.
(iii) Difficult in sharing resources across different admins.
(iv) Grid environment can work with smaller servers.
(v) Some Application may not work with full potential.

20. How does Natural Language Processing work? Write few of its practical applications.

Ans. It's an intuitive behaviour used to convey information and meaning with semantic cues such as words, signs or images. While the terms AI and NLP might conjure images of futuristic robots, there are already basic examples of NLP at work in our daily lives.

In natural language processing, human language is separated into fragments so that the grammatical structure of sentences and the meaning of words can be analyzed and understood in context. This helps computers read and understand spoken or written text in the same way as humans.

NLP combines computational linguistics-rule-based modeling of human language—with statistical, machine learning and deep learning models. NLP drives computer programs that translate text from one language to another, respond to spoken commands and summarize large volumes of text rapidly—even in real time.

Practical Applications

(i) **Search Autocorrect and Autocomplete** Whenever you search for something on Google, after typing 2-3 letters, it shows you the possible search terms. It's a wonderful application of natural language processing and a great example of how it is affecting millions around the world, including you and me. Search autocomplete and autocorrect both help us in finding accurate results much efficiently.

(ii) **Language Translator** It translates a piece of text in one language to another .The technique behind it is Machine Translation.

Machine Translation is the procedure of automatically converting the text in one language to another language while keeping the meaning intact.

Due to evolution in the field of neural networks, availability of humongous data and powerful machines, machine translation has become fairly accurate in converting the text from one language to another.

Today, tools like Google Translate can easily convert text from one language to another language. These tools are helping numerous people and businesses in breaking the language barrier and becoming successful.

(iii) **Social Media Monitoring** More and more people these days have started using social media for posting their thoughts about a particular product, policy or matter. These could contain some useful information about an individual's likes and dislikes. Hence analyzing this unstructured data can help in generating valuable insights. Natural Language Processing comes to rescue here too.

Today, various NLP techniques are used by companies to analyze social media posts and know what customers think about their products.

(iv) **Chatbots** Customer service and experience are the most important thing for any company. It can help the companies improve their products and also keep the customers satisfied. But interacting with every customer manually, and resolving the problems can be a tedious task. This is where Chatbots come into the picture. Chatbots help the companies in achieving the goal of smooth customer experience.

Chapter Test

Multiple Choice Questions

1. ..... allows users to have access to their digital resources from any part of the world.
(a) Phone (b) Tablet
(c) Computer (d) Cloud computing

2. Google drive is a ..... area in the cloud.
(a) personal (b) special
(c) public (d) None of these

3. SaaS stands for
(a) System as a Service (b) Synchronisation as a Service
(c) Software as a Service (d) None of these

4. ..... is an application area of voice / speech recognition.
(a) Playing back simple information (b) Call steering
(c) Automated identification of caller (d) All of these

5. In cloud computing , the cloud means
(a) a world of computers/ devices on a network that store and supply information to clients
(b) computing in a local network
(c) computing at high speed
(d) computing in a metropolitan area network

Short Answer Type Questions

6. Write some disadvantages of robots.

7. Justify the following statement-
'Storage of data is cost-effective and time-saving in cloud computing.' (**NCERT**)

8. Five friends plan to try a startup. However, they have a limited budget and limited computer infrastructure. How can they avail the benefits of cloud services to launch their startup? (**NCERT**)

9. Write the use of virtual reality in gaming.

Long Answer Type Questions

10. Write some advantages of robots .

11. Explain the practical usage of big data in various industries .Also, list names of such fields where they are used.

12. What is your view on PaaS ? Write few examples of PaaS.

13. Explain the sensor component of IoT system.

14. Compare advantages and disadvantages of smart cities.

Answers

Multiple Choice Questions

1. *(d)* ***2.*** *(a)* ***3.*** *(c)* ***4.*** *(d)* ***5.*** *(a)*