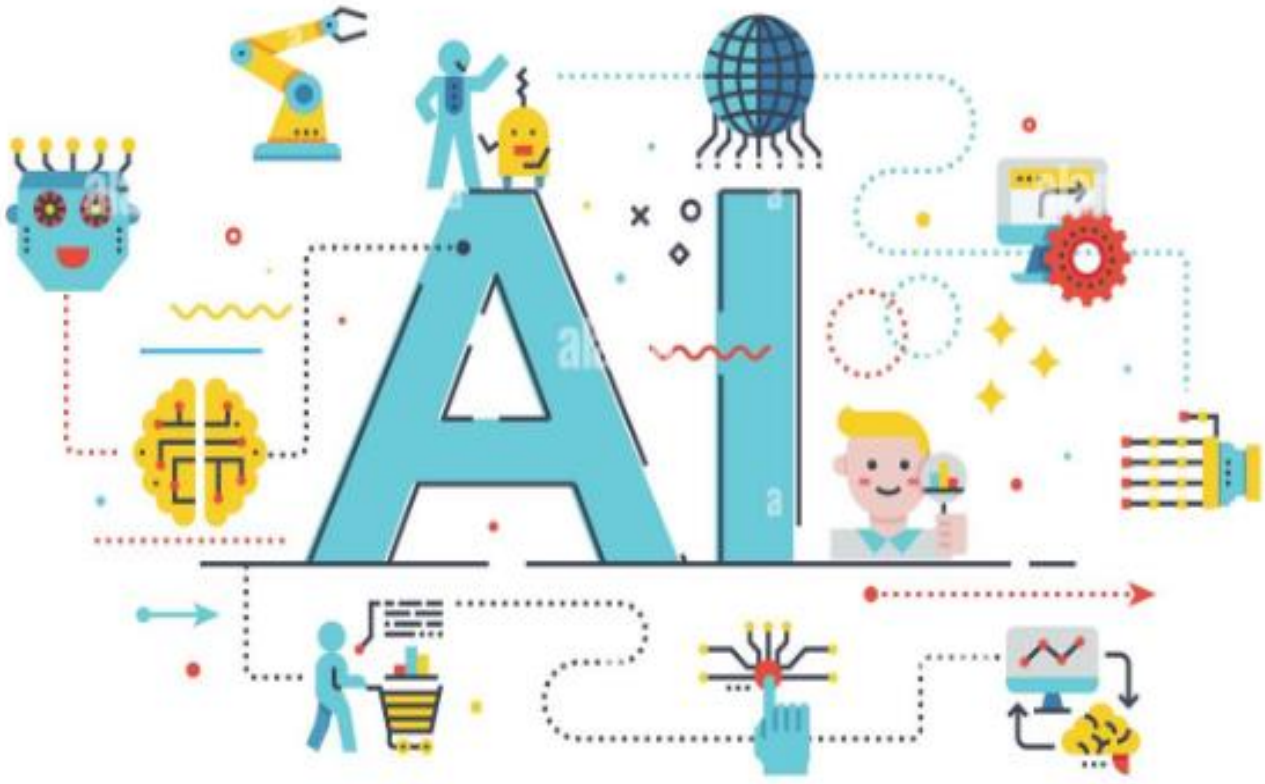
ACDEMIC WINDOW

ARTIFICIAL INTELLIGENCE

Grade 10



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ARTIFICIAL INTELLIGENCE (SUBJECT CODE 417)

CLASS – X (SESSION 2022-2023)

Total Marks: 100 (Theory-50 + Practical-50)

	UNITS	NO. OF HOURS for Theory and Practical	MAX. MARKS for Theory and Practical
PART A	**Employability Skills**		
	Unit 1: Communication Skills-II*	10	-
	Unit 2: Self-Management Skills-II	10	3
	Unit 3: ICT Skills-II	10	3
	Unit 4: Entrepreneurial Skills-II	15	4
	Unit 5: Green Skills-II*	05	-
	Total	**50**	**10**
PART B	**Subject Specific Skills**		**Marks**
	Introduction to Artificial Intelligence (AI)		10
	AI Project Cycle		10
	Natural Language Processing		10
	Evaluation		10
	Total		**40**
PART C	**Practical Work:** • Advance Python • Data Science • Computer Vision		
	Practical Examination		35
	Viva Voce		
	Total		**35**
PART D	**Project Work / Field Visit / Practical File / Student Portfolio**		15
	Viva Voce		
	Total		**15**
	GRAND TOTAL	**200**	**100**

Note: *** marked units are to be assessed through Internal Assessment/ Student Activities. They are not to be assessed in Theory Exams**

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The detailed curriculum/ topics to be covered under Part A: Employability Skills can be downloaded from CBSE website.

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills-II	10
2.	Unit 2: Self-management Skills-II	10
3.	Unit 3: Information and Communication Technology Skills-II	10
4.	Unit 4: Entrepreneurial Skills-II	15
5.	Unit 5: Green Skills-II	05
	TOTAL	**50**

Part-B – SUBJECT SPECIFIC SKILLS

Units to be assessed in theory examinations:

- Introduction to Artificial Intelligence (AI)
- AI Project Cycle
- Natural Language Processing
- Evaluation

Units to be assessed through Practicals:

- Advance Python
- Data Science
- Computer Vision

DETAILS OF THE UNITS:

Units to be assessed in theory examinations:

UNIT	SUB-UNIT	SESSION / ACTIVITY / PRACTICAL
INTRODUCTION TO AI	Foundational concepts of AI	**Session**: What is Intelligence?
		Session: Decision Making. • How do you make decisions? • Make your choices!
		Session: what is Artificial Intelligence and what is not?
	Basics of AI: Let's Get Started	**Session**: Introduction to AI and related terminologies. • Introducing AI, ML & DL. • Introduction to AI Domains (Data, CV & NLP)

UNIT	SUB-UNIT	SESSION / ACTIVITY / PRACTICAL
		Session: Applications of AI – A look at Real-life AI implementations
		Session: AI Ethics
AI PROJECT CYCLE	Introduction	**Session:** Introduction to AI Project Cycle
	Problem Scoping	**Session:** Understanding Problem Scoping & Sustainable Development Goals
	Data Acquisition	**Session:** Simplifying Data Acquisition
	Data Exploration	**Session:** Visualising Data
	Modelling	**Session:** Introduction to modelling • Introduction to Rule Based & Learning Based AI Approaches • Introduction to Supervised Unsupervised & Reinforcement Learning Models • Neural Networks
	Evaluation	**Session:** Evaluating the idea!
NATURAL LANGUAGE PROCESSING	Introduction	**Session:** Introduction to Natural Language Processing
		Session: NLP Applications
		Session: Revisiting AI Project Cycle
	Chatbots	**Activity:** Introduction to Chatbots
	Language Differences	**Session:** Human Language VS Computer Language
	Concepts of Natural Language Processing	**Hands-on:** Text processing • Data Processing • Bag of Words • TFIDF ***(Optional)***** • NLTK
EVALUATION	Introduction	**Session:** Introduction to Model Evaluation
	Confusion Matrix	**Session & Activity:** Confusion Matrix
	Evaluation Score Calculation	**Session:** Understanding Accuracy, Precision, Recall & F1 Score
		Activity: Practice Evaluation

****NOTE: Optional components shall not be assessed. They are for extra knowledge***

UNIT	SUB-UNIT	SESSION / ACTIVITY / PRACTICAL
		Session: Revisiting AI Project Cycle
	Concepts of Data Sciences	**Session**: Python for Data Sciences
		Session: Statistical Learning & Data Visualisation
	K-nearest neighbour model ***(Optional)*****	**Activity:** Personality Prediction ***(Optional)*****
		Session: Understanding K-nearest neighbour model ***(Optional)*****
COMPUTER VISION (To be assessed through Practicals)	Introduction	**Session:** Introduction to Computer Vision
		Session: Applications of CV
	Concepts of Computer Vision	**Session & Activity:** Understanding CV Concepts • Pixels • How do computers see images? • Image Features
	OpenCV	**Session:** Introduction to OpenCV
		Hands-on: Image Processing
	Convolution Operator ***(Optional)*****	**Session:** Understanding Convolution operator ***(Optional)*****
		Activity: Convolution Operator ***(Optional)*****
	Convolution Neural Network ***(Optional)*****	**Session:** Introduction to CNN ***(Optional)*****
		Session: Understanding CNN ***(Optional)***** • Kernel • Layers of CNN
		Activity: Testing CNN ***(Optional)*****

*** NOTE: To be assessed through Practicals only and should not be assessed with the Theory Exam.**

*****NOTE: Optional components shall not be assessed. They are for extra knowledge***

Units to be assessed through Practicals:

UNIT	SUB-UNIT	SESSION / ACTIVITY / PRACTICAL
ADVANCE PYTHON (To be assessed through Practicals)	Recap	**Session**: Jupyter Notebook
		Session: Introduction to Python
		Session: Python Basics
DATA SCIENCES (To be assessed through Practicals)	Introduction	**Session**: Introduction to Data Science
		Session: Applications of Data Science

UNIT	SUB-UNIT	SESSION / ACTIVITY / PRACTICAL
		Session: Revisiting AI Project Cycle
	Concepts of Data Sciences	**Session**: Python for Data Sciences
		Session: Statistical Learning & Data Visualisation
	K-nearest neighbour model ***(Optional)*****	**Activity:** Personality Prediction ***(Optional)*****
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	Convolution Neural Network ***(Optional)*****	**Session:** Introduction to CNN ***(Optional)*****
		Session: Understanding CNN ***(Optional)***** • Kernel • Layers of CNN
		Activity: Testing CNN ***(Optional)*****

UNIT 1

INTRODUCTION TO AI

Introduction to AI: Foundational Concepts

What is Intelligence?

Humans have been developing machines which can make their lives easier. Machines are made with
an intent of accomplishing tasks which are either too tedious for humans or are time consuming. Hence, machines help us by working for us, thereby sharing our load and making it easier for us to fulfil such goals.:
But even though one is more skilled in intelligence than the other, it should be noted that in fact all humans have all 9 of these intelligences only at different levels. One might be an expert at painting, while the other might be an expert in mathematical calculations. One is a musician, the other is an expert dancer.
In other words, we may define intelligence as:
• Ability to interact with the real world

o To perceive, understand and act
▪ Example: Speech Recognition – Understanding and synthesis
▪ Example: Image Recognition
▪ Example: Ability to take action: to have an effect
• Reasoning and planning

o Modelling the external world, given input
▪ Solving new problems, planning, and making decisions
▪ Ability to deal with unexpected problems, uncertainties
• Learning and adaptation
o Continuous learning and adapting graph
▪ Our internal models are always being updated
▪ Example: Baby learning to categorize and recognize animals

Mathematical Logical Reasoning	•A person's ability to regulate, measure, and understand numerical symbols, abstraction and logic.
Linguistic Intelligence	•Language processing skills both in terms of understanding or implementation in writing or verbally.
Spatial Visual Intelligence	•It is defined as the ability to perceive the visual world and the relationship of one object to another.
Kineasthetic Intelligence	•Ability that is related to how a person uses his limbs in a skilled manilr.
Musical Intelligence	•As the name suggests, this intelligence is about a person's ability to recognize and create sounds, rhythms, and sound patterns.
Intrapersonal Intelligence	•Describes how high the level of self-awareness someone has is. Starting from realizing weakness, strength, to his own feelings.
Existential Intelligence	•An additional category of intelligence relating to religious and spiritual awareness.
Naturalist Intelligence	•An additional category of intelligence relating to the ability to process information on the environment around us.
Interpersonal intelligence	•Interpersonal intelligence is the ability to communicate with others by understanding other people's feelings & influence of the person.

What is Artificial Intelligence?

When a machine possesses the ability to mimic human traits, i.e., make decisions, predict the future, learn and improve on its own, it is said to have artificial intelligence. In other words, you can say that a machine is artificially intelligent when it can accomplish tasks by itself -collect data, understand it, analyze it, learn from it, and improve it.

Applications of Artificial Intelligence around us

Every now and then, we surf the internet for things on Google without realizing how efficiently Google always responds to us with accurate answers. Not only does it come up with results to our search in a matter of seconds, it also suggests and autocorrects our typed sentences.

We nowadays have pocket assistants that can do a lot of tasks at just one command. Alexa, Google Assistant, Cortana, Siri are some very common examples of the voice assistants which are a major part of our digital devices.

To help us navigate to places, apps like UBER and Google Maps come in haman. Thus, one no longer needs to stop repeatedly to ask for directions.

AI has completely enhanced the gaming experience for its users. A lot of games nowadays are backed up with AI which helps in enhancing the graphics, come up with new difficulty levels, encourage gamers, etc.

AI has not only made our lives easier but has also been taking care of our habits, likes, and dislikes. This is why platforms like Netflix, Amazon, Spotify, YouTube etc. Show us recommendations on the basis of what we like.

What is not AI?

- A fully automatic washing machine can work on its own, but it requires human intervention to select the parameters of washing and to do the necessary preparation for it to function correctly before each wash, which makes it an example of automation, not AI.
- An air conditioner can be turned on and off remotely with the help of internet but still needs a human touch. This is an example of Internet of Things (IoT).
- Since the bot or the automation machine is not trained with any data, it does not count as AI.

Fill in the Blanks:

One (01) Mark Questions

1. The basis of decision making depends upon the availability of and how we experience and understand it. (information/data/conditions/ past experience/knowledge/awareness.)
2. A machine can also become intelligent if it is trained with which helps them achieve their tasks (data)

True/False:

1. A machine is artificially intelligent when it can accomplish tasks by itself. (True)
2. Is a smart washing machine an example of an Artificially Intelligent devices? (False)
3. Platforms like Netflix, Amazon, Spotify, YouTube etc. show us recommendations on the basis of what we like. (True)

Two (02) marker questions

1. What do you understand by Mathematical Logical Reasoning Intelligence?
2. What do you understand by Interpersonal Skills ?
3. Define Artificial Intelligence.

4. Mention two types of machines which have evolved with time

5. How does a machine become Artificially Intelligent?

Four (04) marker questions

1. What is Intelligence? Explain in brief any three types of intelligence that are mainly perceived by human beings?

2. Differentiate between what is AI and what is not AI with the help of an example?

3. Read the given scenario and answer the questions that follow:

A firefighter has to get to a burning building as quickly as he can. There are three paths that he can take. He can take his fire engine over a large hill (5 miles) at 8 miles per hour. He can take his fire engine through a windy road (7 miles) at 9 miles per hour. Or he can drive his fire engine along a dirt road which is 8 miles at 12 miles per hour. Which way should he choose? (speed=distance/time)

4. How intelligent robots are helping us in accomplishing dangerous jobs?

5. How AI helps in giving you personalized experience online?

UNIT 1

Introduction to AI: Basics of AI

Various organizations have coined their own versions of defining Artificial Intelligence.

- NITI Aayog: National Strategy for Artificial Intelligence
- World Economic Forum
- European Artificial Intelligence (AI) leadership, the path for an integrated vision
- Encyclopedia Britannica

AI can be defined as:
AI is a form of Intelligence, a type of technology and a field of study.
AI theory and development of computer systems (both machines and software) enables machines to
perform tasks that normally require human intelligence.
Artificial Intelligence covers a broad range of domains and applications and is expected to impact every
field in the future. Overall, its core idea is building machines and algorithms which are capable of
performing computational tasks that would otherwise require human like brain functions.

AI, ML & DL

Artificial Intelligence (AI)

Refers to any technique that enables computers to mimic human intelligence. It gives the ability to machines to recognize a human's face; to move and manipulate objects; to understand the voice commands by humans, and also do other tasks. The AI-enabled machines think algorithmically and execute what they have been asked for intelligently.

Machine Learning (ML)

It is a subset of Artificial Intelligence which enables machines to improve at tasks with experience (data). The intention of Machine Learning is to enable machines to learn by themselves using the provided data and make accurate Predictions/ Decisions.

Deep Learning (DL)

It enables software to train itself to perform tasks with vast amounts of data. In Deep Learning, the machine is trained with huge amounts of data which helps it in training itself around the data. Such machines are intelligent enough to develop algorithms for themselves. Deep Learning is the most advanced form of Artificial Intelligence out of these three. Then comes Machine Learning which is intermediately intelligent and Artificial Intelligence covers all the concepts and algorithms which, in some way or the other mimic human intelligence.

Introduction to AI Domains

Data Sciences

Data sciences is a domain of AI related to data systems and processes, in which the system collects numerous data, maintains data sets and derives meaning/sense out of them.

Example of Data Science

Price Comparison Websites

Computer Vision

Computer Vision, abbreviated as CV, is a domain of AI that depicts the capability of a machine to get and analyse visual information and afterwards predict some decisions about it. The entire process involves image acquiring, screening, analysing, identifying and extracting information.

Examples of Computer Vision

Self-Driving cars/ Automatic Cars, Face Lock in Smartphones

Natural Language Processing

Natural Language Processing, abbreviated as NLP, is a branch of artificial intelligence that deals with the interaction between computers and humans using the natural language. *Natural language* refers to language that is spoken and written by people, and natural language processing (NLP) attempts to extract information from the spoken and written word using algorithms.

Examples of Natural Language Processing

Email filters, Smart assistants

AI Ethics

Lack of transparency, poor accountability, unfairness, and bias are found in these automated tools.With millions of lines of code in each application it is difficult to know what values are inculcated in software and algorithms to reach decisions.

Data Privacy

The world of Artificial Intelligence revolves around Data. Every company whether small or big is mining data from as many sources as possible. More than 70% of the data collected till now has been collected in the last 3 years which shows how important data has become in recent times. It is not wrongly said that *Data is the new gold*.

AI Bias

Another aspect to AI Ethics is bias. Everyone has a bias of their own no matter how much one tries to be unbiased, we in some way or the other have our own biases even towards smaller things. Biases are not negative all the time. Sometimes, it is required to have a bias to control a situation and keep things working.

AI Access

Since Artificial Intelligence is still a budding technology, not everyone has the opportunity to access it. The people who can afford AI enabled devices make the most of it while others who cannot are left behind.

As we all can see, kids nowadays are smart enough to understand technology from a very early age. As their thinking capabilities increase, they start becoming techno-savvy and eventually they learn everything more easily than an adult.

Fill in the blanks:

One (01) Mark Questions

1. One of the major sources of data for many major companies is the device which all of us have in our hands all the time (Smartphone/ Mobile Phones)

2. The world of Artificial Intelligence revolves around (Data) True/False:

3. All the apps collect some kind of data. (True)

4. Snapchat filters use and to enhance your selfie with flowers, cat ears etc.

    a) machine learning and deep learning

    b) data and image processing

    c) augmented reality and machine learning

    d) NLP and computer vision

5. Rock paper and scissors game is based on the following domain:

    a) Data for AI

    b) Natural Language Processing

    c) Computer Vision

    d) Image processing

Two (02) Mark Questions

1. Define Machine Learning?

2. Define Deep learning?

3. What are the three domains of AI?

4. Name any two examples of Data science?

5. Where do we collect data from?

Four (04) Mark Questions

1. What do you understand by AI bias? Discuss in detail with some examples.

2. Why do apps collect data in our phone?

3. As Artificially Intelligent machines become more and more powerful, their ability to accomplish tedious tasks is becoming better. Hence, it is now that AI machines have started replacing humans in factories. While people see it in a negative way and say AI has the power to bring mass unemployment and one day, machines would enslave humans, on the other hand, other people say that machines are meant to ease our lives. If machines over take monotonous and tedious tasks, humans should upgrade their skills to remain their masters always. ***What according to you is a better approach towards this ethical concern? Justify your answer***

4. (Case Study)

AI and robotics have raised some questions regarding liability. Take for example the scenario of an 'autonomous' or AI-driven robot moving through a factory. Another robot surprisingly crosses its way and our robot draws aside to prevent collision. However, by this maneuver the robot injures a person.

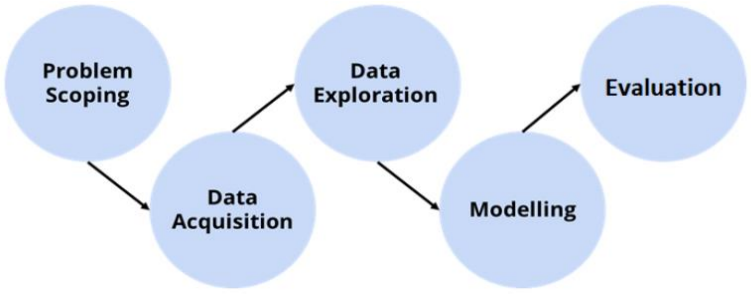
1. Who can be held liable for damages caused by autonomous systems?

2. List two AI Ethics

UNIT 2

AI Project Cycle

AI Project Cycle provides us with an appropriate framework which can lead us towards the goal. The AI Project Cycle mainly has 5 stages:



Problem Scoping

Scoping a problem is not that easy as we need to have a deeper understanding around it so that the picture becomes clearer while we are working to solve it. Hence, we use the 4Ws Problem Canvas to help us out.

4Ws Problem Canvas

The 4Ws Problem canvas helps in identifying the key elements related to the problem.

Data Acquisition

This stage is about acquiring data for the project. Let us first understand what is Data. Data can be a piece of information or facts and statistics collected for reference or analysis. Whenever we want an AI project to be able to predict an output, we need to train it first using data. There can be various ways in which you can collect data. Some of them are: Surveys, Web Scraping, Sensors, Cameras, observations, and API

Data Exploration

Quickly get a sense of the trends, relationships and patterns contained within the data.

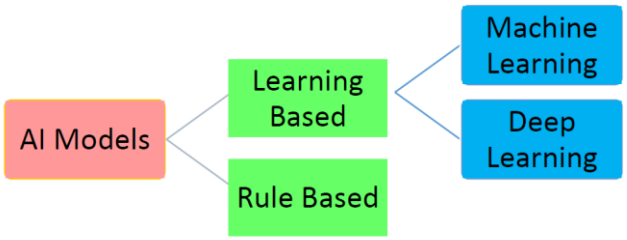
- Define strategy for which model to use at a later stage.
- Communicate the same to others effectively. To visualise data, we can use various types of visual representations

Modelling

The graphical representation makes the data understandable for humans as we can discover trends and patterns out of it. But when it comes to machines accessing and analysing data, it needs the data in the most basic form of numbers (which is binary – 0s and 1s) and when it

comes to discovering patterns and trends in data, the machine goes in for mathematical representations of the same.

AI models can be classified as follows:



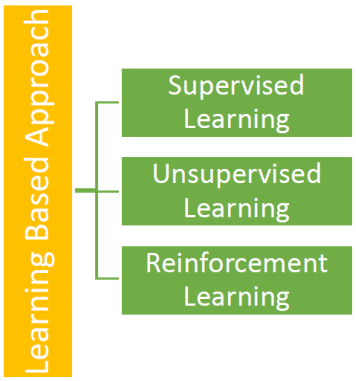
Rule Based Approach

Refers to the AI modelling where the rules are defined by the developer. The machine follows the rules or instructions mentioned by the developer and performs its task accordingly.

Learning Based Approach

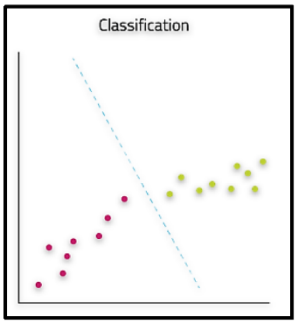
Refers to AI modelling where the machine learns by itself. Under the Learning Based approach, the AI model gets trained on the data fed to it and then is able to design a model which is adaptive to the change in data.

The learning-based approach can further be divided into three parts:



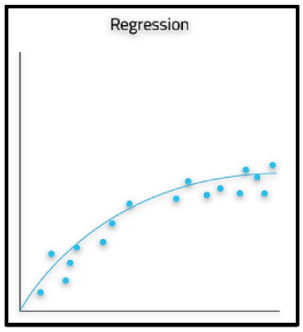
Supervised Learning

In a supervised learning model, the dataset which is fed to the machine is labelled. In other words, we can say that the dataset is known to the person who is training the machine only then he/she is able to label the data. A label is some information which can be used as a tag for data. For example, students get grades according to the marks they secure in examinations. These grades are labels which categorize the students according to their marks.



There are two types of Supervised Learning models:

Classification: Where the data is classified according to the labels. For example, in the grading system, students are classified on the basis of the grades they obtain with respect to their marks in the examination. This model works on discrete dataset which means the data need not be continuous.



Regression: Such models work on continuous data. For example, if you wish to predict your next salary, then you would put in the data of your previous salary, any increments, etc., and would train the model. Here, the data which has been fed to the machine is continuous.

Unsupervised Learning

An unsupervised learning model works on unlabelled dataset. This means that the data which is fed to the machine is random and there is a possibility that the person who is training the model does not have any information regarding it. The unsupervised learning models are used to identify relationships, patterns and trends out of the data which is fed into it. It helps the user in understanding what the data is about and what are the major features identified by the machine in it.

Unsupervised learning models can be further divided into two categories:

Clustering: Refers to the unsupervised learning algorithm which can cluster the unknown data according to the patterns or trends identified out of it. The patterns observed might be the ones which are known to the developer, or it might even come up with some unique patterns out of it.

Dimensionality Reduction: We humans can visualize up to 3-Dimensions only but according to a lot of theories and algorithms, there are various entities which exist beyond 3-Dimensions. For example, in Natural language Processing, the words are N-Dimensional entities. Which means that we cannot visualize them as they exist beyond our visualization ability. Hence, to make sense out of it, we need to reduce their dimensions. Here, dimensionality reduction algorithm is used.

Evaluation

Once a model has been made and trained, it needs to go through proper testing so that one can calculate the efficiency and performance of the model. Hence, the model is tested with the help of Testing Data (which was separated out of the acquired dataset at Data Acquisition stage) and the efficiency of the model is calculated based on the parameters.

Neural Networks

Neural networks are loosely modelled after how neurons in the human brain behave. The key advantage of neural networks are that they are able to extract data features automatically without needing the input of the programmer. A neural network is essentially a system of organizing machine learning algorithms to perform certain tasks. It is a fast and efficient way to solve problems for which the dataset is very large, such as in images.

One (01) Mark Questions

1. Name all the stages of an AI Project cycle.
2. What are sustainable development goals?
3. What is Testing Dataset?
4. What is the objective of evaluation stage?
5. Fill in the blank: The analogy of an Artificial Neural Network can be made with (Parallel Processing) _____?
6. Which of the following is not an authentic source for data acquisition?
   a. Sensors b. Surveys c. Web Scraping d. System Hacking
7. Fill in the blank: Neural Network is a mesh of multiple _____.

Two (02) Mark Questions

1. What are the two different approaches for AI modelling? Define them.
2. What is a problem statement template and what is its significance?
3. Mention the precautions to be taken while acquiring data for developing an AI Project.
4. What do you mean by Data Features?
5. Draw the graphical representation of Classification AI model. Explain in brief

Four (04) Mark Questions

1. What are the features of an Artificial Neural Network?
2. Explain the relation between data size and model performance of an Artificial Neural Network.
3. Differentiate between classification and clustering algorithms with the help of suitable examples.
4. Five sustainable Development Goals are mentioned below. Write 2 problems under each goal that you think should be addressed for achieving the goal.
   a. Quality Education
   b. Reduced Inequalities
   c. Life on Land
   d. No Poverty
   e. Clean Water and Sanitation
5. Do ethics in AI hamper data acquisition stage? Justify your answer.

UNIT 3

Natural Language Processing

Introduction

Natural Language Processing, or NLP, is the sub-field of AI that is focused on enabling computers to understand and process human languages. AI is a subfield of Linguistics, Computer Science, Information Engineering, and Artificial Intelligence concerned with the interactions between computers and human (natural) languages, how to program computers to process and analyse large amounts of natural language data.

Applications of Natural Language Processing

Automatic Summarization: Information overload is a real problem when we need to access a specific, important piece of information from a huge knowledge base. Automatic summarization is relevant not only for summarizing the meaning of documents and information, but also to understand the emotional meanings within the information, such as in collecting data from social media.

Sentiment Analysis: The goal of sentiment analysis is to identify sentiment among several posts or even in the same post where emotion is not always explicitly expressed. Companies use Natural Language Processing applications, such as sentiment analysis, to identify opinions and sentiment online to help them understand what customers think about their products and services (i.e., "I love the new iPhone" and, a few lines later "But sometimes it doesn't work well" where the person is still talking about the iPhone) and overall indicators of their reputation.

Text classification: Text classification makes it possible to assign predefined categories to a document and organize it to help you find the information you need or simplify some activities. For example, an application of text categorization is spam filtering in email.

Chatbots

Script-bot	Smart-bot
Script bots are easy to make	Smart-bots are flexible and powerful
Script bots work around a script which is programmed in them	Smart bots work on bigger databases and other resources directly
Mostly they are free and are easy to integrate to a messaging platform	Smart bots learn with more data
No or little language processing skills	Coding is required to take this up on board
Limited functionality	Wide functionality

Arrangement of the words and meaning

This is the issue related to the syntax of the language. Syntax refers to the grammatical structure of a sentence.

Analogy with programming language

Different syntax, same semantics: 2+3 = 3+2
Here the way these statements are written is different, but their meanings are the same that is 5.
Different semantics, same syntax: 2/3 (Python 2.7) ≠ 2/3 (Python 3)
Here the statements written have the same syntax but their meanings are different. In Python 2.7, this statement would result in 1 while in Python 3, it would give an output of 1.5.

Multiple Meanings of a word

Let's consider these three sentences:
His face turned red after he found out that he took the wrong bag
What does this mean? Is he feeling ashamed because he took another person's bag instead of his? Is he feeling angry because he did not manage to steal the bag that he has been targeting?

The red car zoomed past his nose
Probably talking about the color of the car

His face turns red after consuming the medicine
Is he having an allergic reaction? Or is he not able to bear the taste of that medicine?

Here we can see that context is important. We understand a sentence almost intuitively, depending on our history of using the language, and the memories that have been built within. In all three sentences, the word red has been used in three different ways which according to the context of the statement changes its meaning completely. Thus, in natural language, it is important to understand that a word can have multiple meanings and the meanings fit into the statement according to the context of it.

Perfect Syntax, no Meaning

Sometimes, a statement can have a perfectly correct syntax but it does not mean anything. For example, take a look at this statement:
Chickens feed extravagantly while the moon drinks tea.
This statement is correct grammatically but does this make any sense? In Human language, a perfect balance of syntax and semantics is important for better understanding.

Data Processing

Humans interact with each other very easily. For us, the natural languages that we use are so convenient that we speak them easily and understand them well too. But for computers, our languages are very complex. As you have already gone through some of the complications in human languages above, now it is time to see how Natural Language Processing makes it possible for the machines to understand and speak in the Natural Languages just like humans.

Text Normalisation

In Text Normalisation, we undergo several steps to normalise the text to a lower level. Before we begin, we need to understand that in this section, we will be working on a collection of written text. That is, we will be working on text from multiple documents and the term used for the whole textual data from all the documents altogether is known as corpus. Not only would we go through all the steps of Text Normalisation, we would also work them out on a corpus.

Sentence Segmentation

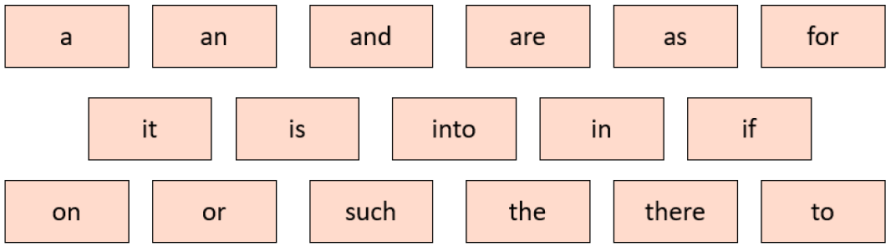
Under sentence segmentation, the whole corpus is divided into sentences. Each sentence is taken as a different data so now the whole corpus gets reduced to sentences.

Tokenisation

After segmenting the sentences, each sentence is then further divided into tokens. Tokens is a term used for any word or number or special character occurring in a sentence. Under tokenisation, every word, number and special character is considered separately and each of them is now a separate token.

Removing Stopwords, Special Characters and Numbers

Stopwords are the words which occur very frequently in the corpus but do not add any value to it. Humans use grammar to make their sentences meaningful for the other person to understand. But grammatical words do not add any essence to the information which is to be transmitted through the statement hence they come under stopwords. Some examples of stopwords are:



Converting text to a common case

After the stopwords removal, we convert the whole text into a similar case, preferably lower case. This ensures that the case-sensitivity of the machine does not consider same words as different just because of different cases.

Stemming

In this step, the remaining words are reduced to their root words. In other words, stemming is the process in which the affixes of words are removed and the words are converted to their base form.

Lemmatization

Stemming and lemmatization both are alternative processes to each other as the role of both the processes is same – removal of affixes. But the difference between both of them is that in lemmatization, the word we get after affix removal (also known as lemma) is a meaningful one. Lemmatization makes sure that lemma is a word with meaning and hence it takes a longer time to execute than stemming.

Bag of Words

Bag of Words is a Natural Language Processing model which helps in extracting features out of the text which can be helpful in machine learning algorithms. In bag of words, we get the occurrences of each word and construct the vocabulary for the corpus.

The bag of words gives us two things:
1. A vocabulary of words for the corpus
2. The frequency of these words (number of times it has occurred in the whole corpus).

Here is the step-by-step approach to implement bag of words algorithm:
1. Text Normalisation: Collect data and pre-process it
2. Create Dictionary: Make a list of all the unique words occurring in the corpus. (Vocabulary)

3. Create document vectors: For each document in the corpus, find out how many times the word from the unique list of words has occurred.

4. Create document vectors for all the documents.

TFIDF: Term Frequency & Inverse Document Frequency

TFIDF stands for Term Frequency and Inverse Document Frequency. TFIDF helps un in identifying the value for each word. Let us understand each term one by one.

Term Frequency

Term frequency is the frequency of a word in one document. Term frequency can easily be found from the document vector table as in that table we mention the frequency of each word of the vocabulary in each document.

Term Frequency Inverse Document Frequency

TFIDF(W) = TF(W) * log(IDF(W))

Applications of TFIDF

TFIDF is commonly used in the Natural Language Processing domain. Some of its applications are:

Document Classification	Topic Modelling	Information Retrieval System	Stop word filtering
Helps in classifying the type and genre of a document.	It helps in predicting the topic for a corpus.	To extract the important information out of a corpus.	Helps in removing the unnecessary words out of a text body.

One (01) Mark Questions

1. What is a Chabot?
2. What is the full form of NLP?
3. While working with NLP what is the meaning of?
   a. Syntax
   b. Semantics
4. What is the difference between stemming and lemmatization?
5. What is the full form of TFIDF?
6. What is term frequency?
7. Which package is used for Natural Language Processing in Python programming?
8. What do you mean by corpus?
9. What are the types of data used for Natural Language Processing applications?
10. What do you mean by document vectors?

Two (02) Mark Questions

1. What is TFIDF? Write its formula.
2. Define the following:
   Stemming
   Lemmatization
3. Which words in a corpus have the highest values and which ones have the least?
4. What is the significance of converting the text into a common case?
5. Mention some applications of Natural Language Processing.

Four (04) Mark Questions

1. Create a document vector table for the given corpus:
Document 1: We are going to Mumbai Document 2: Mumbai is a famous place. Document 3: We are going to a famous place. Document 4: I am famous in Mumbai.

We	Are	going	to	Mumbai	is	a	famous	place	I	am	in
1	1	1	1	1	0	0	0	0	0	0	0
0	0	0	0	1	1	1	1	1	0	0	0
1	1	1	1	0	0	1	1	1	0	0	0
0	0	0	0	1	0	0	1	0	1	1	1

2. Explain how AI can play a role in sentiment analysis of human beings?
3. What are the steps of text Normalization? Explain them in brief.

4. Through a step-by-step process, calculate TFIDF for the given corpus and mention the word(s) having highest value.
Document 1: We are going to Mumbai
Document 2: Mumbai is a famous place.
Document 3: We are going to a famous place.
Document 4: I am famous in Mumbai.

5. Normalize the given text and comment on the vocabulary before and after the normalization:
Raj and Vijay are best friends. They play together with other friends. Raj likes to play football but Vijay prefers to play online games. Raj wants to be a footballer. Vijay wants to become an online gamer.
Normalization of the given text:
Sentence Segmentation:
i. Raj and Vijay are best friends.
ii. They play together with other friends.
iii. Raj likes to play football, but Vijay prefers to play online games.
iv. Raj wants to be a footballer.
v. Vijay wants to become an online gamer.

6. Why are human languages complicated for a computer to understand? Explain.

UNIT 4

Evaluation

What is evaluation?

Evaluation is the process of understanding the reliability of any AI model, based on outputs by feeding test dataset into the model and comparing with actual answers.

Model Evaluation Terminologies

Evaluation Techniques depends on:

1. The type of the model.
2. Purpose of the model.

What is overfitting?

It is important to remember not to use the data we used to build the model, to evaluate the model. This is because our model will simply remember the entire training set and will thus always predict the correct label for any point in time in the training set. This is known as overfitting.

The two parameters are considered for Evaluation of a model

Prediction and Reality are the two parameters considered for Evaluation of a model.
The "Prediction" is the output which is given by the machine and the "Reality"is the real scenario, when the prediction has been made?

True positive:

- The predicted value matches the actual value
- The actual value was positive and the model predicted a positive value

True Negative:

- The predicted value matches the actual value.
- The actual value was negative, and the model predicted a negative value.

False Positive:

- The predicted value was falsely predicted.
- The actual value was negative, but the model predicted a positive value.
- Also known as the Type 1 error

False Negative:

- The predicted value was falsely predicted.
- The actual value was positive, but the model predicted a negative value.
- Also known as the Type 2 error

Confusion matrix

The result of comparison between prediction and reality can be recorded in what we call the confusion matrix. The confusion matrix allows us to understand the predicted results. Prediction and Reality can be easily mapped together with the help of confusion matrix.

Evaluation Methods

Accuracy

Accuracy is defined as the percentage of correct predictions out of all the observations. A prediction can be said to be correct if it matches the reality. Here, we have two conditions in which the Prediction matches with the Reality: True Positive and True Negative. Hence, the formula for Accuracy becomes:

$$Accuracy = \frac{Correct\ prediction}{Total\ cases} * 100\%$$

$$Accuracy = \frac{(TP + TN)}{(TP + TN + FP + FN)} * 100\%$$

Here, total observations cover all the possible cases of prediction that can be True Positive (TP), True Negative (TN), False Positive (FP) and False Negative (FN).

Precision

Precision is defined as the percentage of true positive cases versus all the cases where the prediction is true. That is, it considers the True Positives and False Positives.

$$Precision = \frac{True\ Positive}{All\ Predicted\ Positives} * 100\%$$

$$Precision = \frac{TP}{TP + FP} * 100\%$$

Recall

Recall is defined as the fraction of positive cases that are correctly Identified.

$$Recall = \frac{True\ Positive}{True\ Positive + False\ Negative}$$

$$Recall = \frac{TP}{TP + FN}$$

F1 Score

F1 score can be defined as the measure of balance between precision and recall.

$$F1\ Score = 2 * \frac{Precision * Recall}{Precision + Recall}$$

One (01) Mark Questions

1. Define Evaluation?
2. Which two parameters are considered for Evaluation of a model?
3. What is True Positive?

4. What is True Negative?
5. What is False Positive?
6. What is False Negative?
7. Give an example where High Precision is not usable.
8. What is a confusion matrix?

Two (02) Mark Questions

1. What is meant by Overfitting of Data?
2. What is Accuracy? Mention its formula.
3. What is Precision? Mention its formula.
4. What is Recall? Mention its formula.
5. How do you suggest which evaluation metric is more important for any case?
6. Which evaluation metric would be crucial in the following cases? Justify your answer.
   a. Mail Spamming
   b. Gold Mining
   c. Viral Outbreak

Four (04) Mark Questions

1. What is a confusion matrix? Explain in detail with the help of an example.
2. Calculate Accuracy, Precision, Recall and F1 Score for the following Confusion Matrix on Heart Attack Risk. Also suggest which metric would not be a good evaluation parameter here and why?

The Confusion Matrix	Reality: 1	Reality: 0
Prediction: 1	50	20
Prediction: 0	10	20

3. Calculate Accuracy, Precision, Recall and F1 Score for the following Confusion Matrix on Water Shortage in Schools: Also suggest which metric would not be a good evaluation parameter here and why?

The Confusion Matrix (Water Shortage in School)	Reality: 1	Reality: 0
Prediction: 1	75	5
Prediction: 0	5	15

4. Calculate Accuracy, Precision, Recall and F1 Score for the following Confusion Matrix on SPAM FILTERING: Also suggest which metric would not be a good evaluation parameter here and why?

Confusion Matrix on SPAM FILTERING:	Reality: 1	Reality: 0
Prediction: 1	10	55
Prediction: 0	10	25

UNIT 5

ADVANCE PYTHON

Python operators

1. Arithmetic operators are used with numeric values to perform common mathematical operations.
2. Assignment operators are used to assign values to variables
3. Comparison operators are used to compare two values
4. Logical operators are used to combine conditional statements

Exercise

Identify the operator types in the given expressions and write their names in the space provided:

Expression	Operator
8 * 2 – 5 / 5+3	.....
12 > 50 and 5 != 10	.....
(8 * 2 > 5 * 4) or (5 * 14 < 8 * 3)	.....
A += 2 * (9/3)	.....
10 + 8 / 3 + 5* (2+3)	.....

Programs in Python operators

1. WAP to calculate the compound interest.
2. WAP to calculate the factorial of a number 10 .
3. WAP to read a number in n and prints n^2, n^3 , n^4
4. By inputting 2 numbers WAP to demonstrate
   - Arithmetic Operators.
   - Assignment Operators.
   - Comparison Operators.
   - Logical Operators.
5. Write the output for the below code for python operators

```
#Arithmetic Operators
x= 4
y= 5
print x + y

#Comparison Operators
x = 4
y = 5
print('x > y  is',x>y)
```

```
#Assignment Operators
num1 = 4
num2 = 5
print ("Line 1 - Value of num1 : ", num1)
print ("Line 2 - Value of num2 : ", num2)

#compound assignment operator
num1 = 4
num2 = 5
res = num1 + num2
res += num1
print ("Line 1 - Result of + is ", res)

#Logical Operators
a = True
b = False
print('a and b is',a and b)
print('a or b is',a or b)
print('not a is',not a)

#Identity Operators
x = 20
y = 20
if ( x is y ):
        print "x & y  SAME identity"
y=30
if ( x is not y ):
        print "x & y have DIFFERENT identity"
#Operator precedence
v = 4
w = 5
x = 8
y = 2
z = 0
z = (v+w) * x / y;
print "Value of (v+w) * x/ y is ",  z
```

Type Conversion

The process of converting the value of one data type (integer, string, float, etc.) to another data type is called type conversion. Python has two types of type conversion.

1. Implicit Type Conversion
2. Explicit Type Conversion

Implicit Type Conversion

In Implicit type conversion, Python automatically converts one data type to another data type. This process doesn't need any user involvement.

```
l = 12
b = 2.5
area = l*b
print("Area is :",area)
print("Data type of variable l is :",type(l))
print("Data type of variable b is :",type(b))
print("Data type of variable area is :",type(area))
```

```
Area is : 30.0
Data type of variable l is : <class 'int'>
Data type of variable b is : <class 'float'>
Data type of variable area is : <class 'float'>
```

Output

b. Explicit Type Conversion: In explicit type conversion, you can convert the data type of an object to another data type using predefined functions such as int(), float(), str(), bool(), complex(), tuple(), etc. This type of conversion is also known as typecasting because the user casts (changes) the data type of the objects. For example:

```
l = 12
b = 2.5
h = "3"
print("Data type of variable h before conversion is :",type(h))

new_h = int(h) #conversion of string into integer

print("Data type of variable new_h after conversion is :",type(new_h))
volume = l*b*new_h
print("volume is :",volume)
```

```
Data type of variable h before conversion is : <class 'str'>
Data type of variable new_h after conversion is : <class 'int'>
volume is : 90.0
```

Output

Exercise

Identify the operator types in the given expressions and write their names in the space provided:

Expression	Operator
8 * 2 – 5 / 5+3	.....
12 > 50 and 5 != 10	.....
(8 * 2 > 5 * 4) or (5 * 14 < 8 * 3)	.....
A += 2 * (9/3)	.....
10 + 8 / 3 + 5* (2+3)	.....

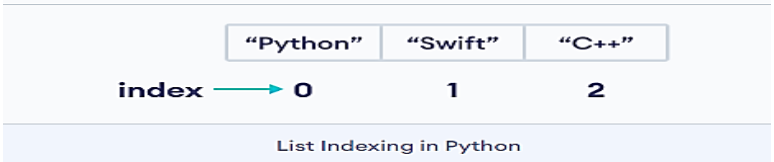
List

A list can store a sequence of values belonging to any data type .It is changeable and allow duplicate members Lists are used to store multiple items in a single variable.

Lists are one of 4 built-in data types in Python used to store collections of data. Lists are created using square brackets

Access elements in a list

We can access elements of an array using the index number (0, 1, 2 …)



List Indexing in Python

Negative Indexing in Python

Python allows negative indexing for its sequences. The index of -1 refers to the last item, -2 to the second last item

Python Negative Indexing

Slicing of a Python List

In Python it is possible to access a section of items from the list using the slicing operator :, not just a single item

```
# List slicing in Python
my_list = ['p','r','o','g','r','a','m','i','z']
# items from index 2 to index 4
print(my_list[2:5])
# items from index 5 to end
print(my_list[5:])
# items beginning to end
print(my_list[:])
```

output

```
['o', 'g', 'r']
['a', 'm', 'i', 'z']
['p', 'r', 'o', 'g', 'r', 'a', 'm', 'i', 'z']
```

`my_list[2:5]` returns a list with items from index **2** to index **4**.

`my_list[5:]` returns a list with items from index **1** to the end.

`my_list[:]` returns all list items

List operations

are the operations that can be performed on the data in the list data structure. A few of the basic list operations used in Python programming are extend(), insert(), append(), remove(), pop(), slice, reverse(), min() & max(), concatenate(), count(), multiply(), sort(), index(), clear(), etc.

Add Elements to a Python List

1. append()

The append() method is used to add elements at the end of the list. This method can only add a single element at a time. To add multiple elements, the append() method can be used inside a loop**.**

2. Using extend()

We use the extend() method to add all items of one list to another.

3. Change List Items

Python lists are mutable. Meaning lists are changeable. And, we can change items of a list by assigning new values using = operator.

Remove an Item From a List

4. Using del()

In Python we can use the del statement to remove one or more items from a list.

5. Using remove()

We can also use the remove() method to delete a list item.

Python List Methods

Python has many useful list methods that makes it really easy to work with lists.

Method	**Description**
append()	add an item to the end of the list
extend()	add items of lists and other iterables to the end of the list
insert()	inserts an item at the specified index
remove()	removes item present at the given index
pop()	returns and removes item present at the given index
clear()	removes all items from the list
index()	returns the index of the first matched item
count()	returns the count of the specified item in the list
sort()	sort the list in ascending/descending order
reverse()	reverses the item of the list
copy()	returns the shallow copy of the list

Python List Length

In Python, we use the len() function to find the number of elements present in a list.

Write the output of the following programs in the given space.

```
lis1= [10, 50, 86, 42, 51, 51, 20, 48, 15, 24, 65]
A = lis1[5 : 8]
B = lis1[3 : ]
C = lis1[-9: -5]
D = lis1[3 : -3]
E = lis1[ : : -1]
print(A)   #line 1
print(B)   #line 2
print(C)   #line 3
print(D)   #line 4
print(E)   #line 5
```

```
lis2= [20, 50, 1, 0, 40, 0, 1]
lis2.insert(3, 80)
print(lis2)        #line 1
lis2.append(12)
print(lis2)        #line 2
lis2.extend([10, 20])
print(lis2)        #line 3
lis2.pop()
print(lis2)        #line 4
lis2.remove(0)
print(lis2)        #line 5
```

Programs

1. WAP to find to find the sum and average of first five numbers in a list.
2. WAP to find print the list of first 5 natural numbers and the squares of odd numbers.
3. WAP to find the first 5 multiples of number in a list input by the user.
4. WAP to swap the first and last element of a list .
5. WAP Program to print a list using 'FOR and IN' loop.
6. WAP to add element in a specified index in a list.
7. WAP to sort elements in a specified list.
8. WAP to find the position of min and max elements of a list in Python.

Tuples

Tuples in Python are a collection of elements in a round bracket () or not but separated by commas. Tuples are similar to list in some operations like indexing, concatenation, etc. but lists are mutable whereas tuples are immutable acts like a string**.**

Empty Tuple

Create a tuple without having any element. An empty tuple is created using a pair of round brackets, ().

Concatenation of Tuples

Add tuples like lists by using plus (+) sign between it

Nested tuples

Nested tuples mean one tuple inside another like nested lists. To create a nested tuple, we have to simply put both or more tuples in the round brackets separated with commas.

Programs

1. WAP to create an empty tuple.
2. WAP to concatenate 2 tuples.
3. WAP to convert list into tuples and tuples into list.
4. WAP to make a nested tuple.
5. WAP to reverse a tuple.

SETS

Python provides the functionality of the mathematical set. As in Mathematical sets, we use curly braces {} in Python to declare a set we use these brackets. These curly braces in python denote the set**.**

Note: The expression set() produces a set with no elements, and thus represents the empty set. Python reserves the {} notation for empty dictionaries**.**

Set add() Method
add() method is used to add an element to the set, the method accepts an element and adds the elements to this set
syntax
set_name.add(element)

Set difference () Method
difference() method is used to find the difference of two sets, the method is called with this set (set1) and another set (set2) is passed as an argument and it returns the set of elements that do not exist in set2.
Syntax:
set_name1.difference(set_name2)

Set intersection () Method
intersection() method is used to get the list of all elements which are commons/exist in given sets.
Syntax:
set1.intersection(set1, set2, set3, ...)

Set union() Method
union() method is used to find the union of all sets, this method is called with this set (set1) and other sets (set1, set2, ...) can be supplied as an arguments, method returns the set containing all elements of all sets (common elements repeat only once).

Syntax:
set1.union(set2, set3, ...)

Programs
1. WAP to find the operations performed by sets.
2. WAP to demonstrate the set difference method.
3. WAP to demonstrate the set add method.
4. WAP to demonstrate the set union method.

Dictionaries

A dictionary is a mapping between a set of indices (keys) and a set of values. It is an extremely useful data storage construct where each element is accessed by a unique key.

A dictionary is like a list, just differ in indexing. In a list, an index value is an integer, while in a dictionary index value can be any other data type called keys. It stores and retrieves the key-value pairs, where each value indexed by a unique key.

Syntax:
Dictionary = {'key1': 'value1','key2': 'value2',...,'keyn': 'valuen'}

Basic Operations in Dictionaries

1) Creation
We can create a dictionary using built-in function dict(), which creates a new dictionary with no items. We can also create dictionary using {}.

2) Initialization and Accessing
To initialize or add an item to the dictionary, square brackets with unique keys are used.

3) Traversing
Traversing refers to visiting each element index at least one to access its value. This can be done using looping or say by using 'for-loop'.

Dictionary Methods in Python

1) Append

We can add new values to the already existing dictionary, just by extending it with single pair of values. If we want to add only single element to the dictionary then we write as:
Syntax
Dictionary_name [key]=value

2) Update

We can also join two dictionaries into one or two dictionaries can be merged in to one by using update() method. Update ( ) merges the keys and values of one dictionary into the other.
Syntax
Dictionary_name1.update (Dictionary_name2)
3) Delete
Using 'del' keyword, we can remove element from the existing dictionary.
Syntax

del Dictionary_name[key]

4) Length
The length or the number of key-value pairs in the dictionary can be determined by using len( ) method.
Syntax
len(dictionary_name)

5) Clear ( )
This method removes all the items from the dictionary.
Syntax
dictionary_name.clear( )

6.has_key( )
This method is used to identify that the following key k is present in the dictionary or not. It returns 'True', if dictionary has a key, otherwise it returns 'False'.
Syntax
dictionary_name.has_key(k)

Programs
1. WAP to create a dictionary
2. WAP to create and initialize a dictionary
3. WAP to traverse a dictionary
4. WAP to demonstrate all dictionary methods (append, update, delete, length and clear)

Conditional statement

Conditional statements decide the flow of program execution. In programming whenever we need to make execute any special blocks based on the decision then we use the conditional statements.

conditional statements available in the Python are,

1. if statements
2. if...else statements
3. if...elif...else statements
4. Nested if statements

1) if statement: It is one of the most common conditional statements in which some conditions are provided and if the condition is true then block under the if the condition will be executed.

Syntax: if condition:

what we want to execute here.

2) if...else statement

In the above, we have seen that if the condition is true then block under if will execute then one thing is, comes to our mind that what happens when the condition will be false. So, to overcome this problem we are using **if...else statements**.

Syntax:

```
if condition:
    # what we want to execute here.
else:
    # what we want to execute here.
```

If the condition is *true*, then it will execute the block of if statements otherwise else statement

3) Python if...elif...else statement

These conditional statements use where we have to check multiple conditions in the program. If these will not *true* that is *false* then the else blocks only execute.

Syntax:

```
if condition:
    # what we want to execute here.
elif conditions:
    # what we want to execute here.
else:
    # what we want to execute here.
```

4) Python Nested if statement

As we all have familiar with the word nested which means one statement inside another statement same in the programming nested if statements mean an if statement inside another if statement that is we can place one if statements inside another if statements.

Syntax:

```
if condition:
    # what we want to execute here.
    if condition:
        # what we want to execute here.
    else:
        # what we want to execute here.
```

Programs

1. WAP to print the empty list
2. WAP to find the maximum of 3 numbers

3. WAP to find the given number is odd or even
4. WAP to find the leap year using calendar module.
5. WAP for the tours and travels company charges their customer as per following criteria according to customer category:

Category	Charges
A	18
B	15
C	12
D	10

6. Read the salary and appraisal score of the user. WAP to implement an increment to the employee's salary based on their appraisal score given in the following table

Appraisal Score	Rate of Increment
0-10	3%
11-30	5%
31-50	8%
51-80	10%
81-100	15%

7.WAP Input same amount and calculate discount based on the amount and given discount rate in Python.

The discount rates are:

Amount	Discount
0-5000	5%
5000-15000	12%
15000-25000	20%
above 25000	30%

8. WAP to calculate the BMI for the gven weight and height of a person .

Example:
Input:
Height = 1.75
Weigth = 64
Output:
BMI is: 20.89 and you are: Health

Control Statements

Loops in Python

There are three types of loops in python:

1. Condition Controlled Loops
2. Range Controlled Loops
3. Collection Controlled Loops

1) Condition Controlled Loops

In Condition controlled Loops, there is condition(expression) that controls the loop.

a. while Loop

2) **Range Controlled Loops**

For loop is used for implementation of **Range()**

There are three ways to use Range():

1. Range with 1 Parameter [range(end)] [start=0, step=1]
2. Range with 2 Parameter [range(start,end)] [step=1]
3. Range with 3 Parameter [range(start,end,step)]

3) Collection Controlled Loops

Collection controlled loops are also implemented with the help of for loop.We need a collection object as a source. Python have various **collection class like: list, tuple, set, dict**

a. with List

b. with tuple

c. with set

d. with dict(dictionary)

Programs [FOR LOOP]

1. WAP to demonstrate the basic functioning of a FOR LOOP.
2. WAP factorial of a given number
3. WAP to print the list using for each loop.
4. WAP to find power of a number using loop
5. WAP to print the number and its squares and cubes.
6. WAP to Iterate a list in reverse order.
7. WAP to input, append and print the list elements.
8. WAP to draw the pattern with symbol.
9. WAP to draw pattern with increasing numbers.
10. WAP to demonstrate the collection-controlled loops examples

Programs [WHILE LOOP]

1. WAP to print the numbers 1 to 10.
2. WAP to print table of number.
3. WAP to prints all letters except 'e' and 's'.
4. WAP to print the numbers in reverse order.
5. WAP to break the loop as soon it sees 'e'.

EMPLOYABILTY

SKILLS

Entrepreneurial Skills

A) Entrepreneur and Entrepreneurship :
An individual who creates a new business, bearing most of the risks to set up a business is called entrepreneur. The process of setting up a business is known as entrepreneurship.

B) Entrepreneurship and Society :
There is a direct relationship between Entrepreneurship and Society. Due to entrepreneurial activity, society is provided with goods and services. In turn, society provides market for products and services provided by the entrepreneur.
Entrepreneurship has some positive impact on society such as:
1. Accentuates economic Growth
2. Fosters Creativity
3. Stimulates Innovation and Efficiency
4. Creates Jobs and Employment Opportunities
5. Solves the problems of the society
6. Encourages welfare of the society

Entrepreneurship has some negative impact on society such as:
1. Environmental Degradation
2. Trade imbalance
3. Labour exploitation

Society plays a role in boosting entrepreneurship by:
1. Creates needs and demands
2. Provides raw materials
3. Enables financial support
4. Creates a need for education
5. Catalyzes policy formation and reform
6. Facilitates networking
7. Supports infrastructure development

C) Some common entrepreneurship activities related to society include :
1) **Social Entrepreneurship** : It can be understood as creation of sustainable solutions for social problems that leads to social change. Many social problems are tackled by social entrepreneurs such as low reach of quality education, health and sanitation, unemployment, child Labour etc.
2) **Agricultural Entrepreneurship**: It can be defined as being primarily related to the marketing and production of inputs and products used in agricultural activities.
3**) Women Entrepreneurship**: It is referred to the entrepreneurial activity led by women, where women undertake risks, create enterprises, organize factors of production, innovate with products/services and generate employment opportunities.
4) **Small Scale Entrepreneurship**: It refers to starting industries in which manufacturing, trading, providing services, productions are done on a small scale or micro scale. These businesses serve as the backbone of many developing countries.

D) Qualities of an Entrepreneur :

1) **Hard work**: Without working hard, no entrepreneur can be successful. On an average, successful entrepreneurs are found to be working anywhere between 60 to 90 hours per week

2) **Optimism:** Positivity and belief in what they do is what takes entrepreneurs far in their journey.

3**) Independence**: Entrepreneurs are confident and like the independence to drive a business on their own.

4) **Energetic:** Energy is always high in successful entrepreneurs which makes them extremely proactive.

5) **Self-confident** : Entrepreneurs are confident to take decision.

E) Functions of an Entrepreneur :

1) **Organisation Building and Management** : An entrepreneur builds the organization by taking various steps such as hiring employees, organizing the factors of production, sourcing finance etc.

2) **Risk taking**: Risk taking is about taking responsibility and planning for a loss or mishap that may occur in the future due to unforeseen contingencies.

3) **Innovation:** Entrepreneurs innovate by introducing new concepts, products, services, designs, ideas etc

4) **Detailed Investigation:** An entrepreneur conducts research, investigates and evaluates an idea considering various factors and estimates the total demand for a new product or service.

5) **Financing**: Raising capital for a business is one of the core functions that entrepreneurs perform themselves at all the stages of business.

6**) Planning**: An entrepreneur documents a business idea in the form of a business plan, to detail each element of the business such as product or service description, operations, marketing, finance etc.

7) **Leadership**: Leadership is more of a skill than a function for an entrepreneur. As a leader, an entrepreneur guides, directs, and influences the work of others to attain specific goals.

8) **Communication** : An entrepreneur has to communicate every single day, in the form of writing, responding, drafting emails, verbal instruction, discussion etc.

F) Role of Entrepreneurs :

1) **Innovator's Role** : Entrepreneurs innovate by bringing unique and new products and services into the market.

2**) Agent's role** : Entrepreneurs act as 'Agents of Change' as they identify opportunities, solve problems, offer effective solutions, establish enterprises, set up industries and bring positive change for the economy.

3) **Coordinating role:** An entrepreneur coordinates many things such as factors of production, delegated tasks, smooth functioning across different business departments etc

4**) Employment Generation role**: Entrepreneurship solves the problem of unemployment, which is a major problem in economic development.

G**) Importance of Entrepreneurs :**

1) **Free market evolution:** In a free market, entrepreneurs bring change in technology, trends and markets. For example, with increase in digital services, entrepreneurs have created companies that offer many home delivery services such as groceries, restaurant food, clothes, accessories etc.
2) **New values:** Sometimes, entrepreneurs choose ethics over profit and offer a more ethical product to the world and are transparent about it.
3) **New markets**: Entrepreneurs can often 'redefine the rules' of an established industry. They do this by creating new markets for existing products and slightly innovating in small ways to suit the needs of a new target market.

H) Myths of Entrepreneurship :
1) Entrepreneurs are born a certain way.
2) Entrepreneurs have to take a lot of risk.
3) Businesses either skyrocket or fail.
4) A lot of money is required to start any business.
5) One must know everything before starting a business.

I) Entrepreneurship as a Career – Why Entrepreneurship for You?
1) Nurtures development of entrepreneurial skills and capabilities.
2) Develops the ability to handle failure and ambiguity.
3) Enhances critical thinking and problem-solving ability.
4) Leads to creating difference in society.

Multiple choice questions

Q1. _____ is the type of self-employment where one is running a business to satisfy the needs of people and looking for ways to make the business better.
a. Entrepreneurship
b. Entrepreneur
c. Business Idea
d. Entrepreneurist
Ans. a. Entrepreneurship
Q2. Which of the following are the qualities of successful entrepreneurs?
a. They are confident.
b. They take responsibility for their actions.
c. They work hard
d. All of the above
Ans. d. All of the above
Q3. _____ are people who work for a person or an organization and get paid for that work.
a. Self employed
b. Wage employed
c. Both of the above
d. None of the above
Ans. b. Wage employed
Q4. _____ people are those who start businesses to satisfy the needs of people.

a. Self-employed
b. Wage-employed
c. Both of the above
d. None of the above

Ans. a. Self-employed

Q5. A self employed person who is always trying to make his/her business better by taking risks and trying new ideas is called _____

a. Skilled man
b. Business man
c. Entrepreneur
d. None of the above

Ans. c. Entrepreneur

Q6. Ramya and Ramu both own plant shops. Ramu sits at his shop every day. When customers come, he sells to them. Ramya walks around and gets customers to her shop. She also sells seeds and flowers. Who is Entrepreneur out of Ramya and Ramu.

a. Ramya
b. Ramu
c. Both of the above
d. None of the above

Ans. a. Ramya

Q7. What do entrepreneurs do when they run their business?

a. They help in increasing jobs in their area.
b. Helping the people in the society to earn money.
c. Both of the above
d. None of the above

Ans. c. Both of the above

Q8. Qualities of successful entrepreneurs are.

a. They keep trying new ideas.
b. They are confident.
c. They are creative
d. All of the above

Ans. d. All of the above

Q9. Ravi's customer comes to his store and starts shouting at him. He does not get angry. He listens to what his customer is saying. He is __

a. Hardworking
b. Confident
c. Patient
d. Trying new ideas

Ans. c. Patient

Q10. Susheela decides to sell her company tyres in Sri Lanka. It does not sell and she has a loss. She apologizes to the people who work for her. She says she will plan better next time. She __

a. takes responsibility for your mistakes
b. thinks before making a decision
c. does not give up
d. is creative

Ans. c. does not give up

Answer the following Questions.

1. Discuss about the qualities you have, or you want to develop to become a successful Entrepreneur?
2. Explain the different roles of entrepreneurs?
3. Write a note on entrepreneurship as career option?
4. What do you think are the important functions of an entrepreneur? Write your answer giving suitable examples
5. What is the difference between a misconception and reality? Give an example.

Green Skills

Sustainability :

- Sustainability is an art of living where we respect our environment and make use of the available resources only to the extent where we can replenish what is available to us for the accessibility of future generation.
- Sustainability focuses on how human beings can live in peace and harmony with nature without creating ecological disturbance.

Sustainable Development :

Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.

The aim is to inculcate the value of using natural resources judiciously and still ensuring its availability for future generations.

We can contribute to create a Sustainable Society by following 4Rs' and 1U of Sustainability. These are REFUSE, REDUCE, REUSE, RECYCLE and UPCYCLE.

1) **REFUSE** : REFUSE is to say 'NO' to use products that may harm the environment.

2) **REDUCE** : REDUCE is minimizing the use of the products that may cause harm to environment.

3) **REUSE** : REUSE the products as far as possible, in order to reduce the waste generation.

4) **RECYCLE** : After reusing the product, we must try to recycle it as far as possible.

5) **UPCYCLING** : UPCYCLING is giving a new look to the old product and making it look desirable. Any product that is not usable can be upcycled with creativity and innovation.

Importance of Sustainable Development :

In the 21st Century the importance of adopting sustainable techniques for sustainable development is of grave importance.

1) Judicious use of resources is of prime importance since the exploitation of resources is causing its depletion.

2) The uneven distribution of available resources across different economic fronts is giving rise to crime and creating social imbalance. To ensure proper balance Sustainability is important.

3) Environmental problems like Climate Change, Emission of Green House gases are alarming. We will be able to combat these issues with the help of Sustainable Development.
4) Adoption of Sustainable Development in our daily life and at our work place will also promote economic growth.
Sustainable Development Goals :
United Nations in 2015 adopted 17 SDGs (Sustainable Development Goals) as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. These SDGs are :

1. No poverty
2. Zero Hunger
3. Good Health and Well Being
4. Quality Education
5. Gender Equality
6. Clean water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice and Strong Institution
17. Partnership for the Goals

Multiple choice questions

Q1. The economy that reduces environmental risks and strikes ecological balance is termed as ____.
a. Green Economy
b. Green Field
c. Green Nature
d. None of the above
Ans. a. Green Economy
Q2. Which of the following will help to protect our environment?
a. Solar Power Plants
b. Waste Water Treatment Plants
c. Electric Vehicles
d. All of the above
Ans. d. All of the above
Q3. Major problems related to sustainable development is/are:
a. Food

b. Fuel
c. Water
d. All of the above
Ans. d. All of the above
Q4. Sustainable development includes ___
a. recycling and reuse of waste materials
b. reducing excessive use of resources
c. using more environment friendly material
d. All of the above**.**
Ans. d. All of the above.
Q5. Which of the following is not included in Sustainable development?
a. Green grassy patches and trees to be interspersed between concrete buildings
b. Use of technologies, which are environmental friendly
c. Excessive use of resources and decreasing resource conservation
d. None of the above
Ans. c. Excessive use of resources and decreasing resource conservation
Q6. SDGs stands for _____
a. Sustainable Development Goals
b. Sustainable Development Goalseeker
c. Sustainable Developmental Goals
d. None of the above
Q7. SDGs were launched at the United Nations in ___
a. 2013
b. 2016
c. 2014
d. 2015
Ans. d. 2015
Q8. There are _____ SDGs.
a. 13
b. 17
c. 12
d. 15
Ans. b. 17
Q9. Which of the following are SDGs?
a. Poverty
b. Climate Change
c. Gender Equality
d. All of the above
Ans. d. All of the above
Q10. In Organic Farming, farmers use _____
a. Chemical Fertilizers
b. Pesticides
c. Chemical Spray
d. None of the above
Ans. d. None of the above
Q11. Which organization has made the Sustainable Development Goals?

a. United Nations
b. League of Nations
c. UNICEF
d. World Health Organisation
Ans. a. United Nations
Q12. Which of the following activities help to conserve the environment?
a. Organic Farming
b. Vermi-Composting
c. Rainwater harvesting
d. All of the above
Ans. d. All of the above
Q13. Organic Farming helps in _____
a. getting better quality chemical free crops
b. Maintaining the soil quality for future use
c. All of the above
d. None of the above
Ans. c. All of the above
Q24. Choose the option which defines sustainable development.
a. Taking care of future generations.
b. Taking care of only ourselves.
c. Taking care of ourselves and the future generations.
d. None of the above
Ans. c. Taking care of ourselves and the future generations.
Q25. _____ increase in consumption of the natural resources.
a. Increasing population
b. Development in all sectors
c. Both of the above
d. None of the above
Ans. c. Both of the above

Answer the following Questions.

1. Define Green Economy.
2. What is Sustainable Development?
3. Where was the UN Conference on Environment and Development held?
4. Write a short note on UNDP
5. Describe the National Action Plan for Climate Change (NAPCC) in 4–5 lines.
6. Explain the importance of the Swachh Bharat Abhiyan in 4–5 lines.
7. List any five stakeholders. Describe why they are important for the green economy.
8. Explain with examples the role of government and private agencies in a green economy.

ICT Skills

Operating System

An operating interface between user and computer which directs the processing of programmes and controls the operation of computer**.**

Some of the functions of Operating system are:

- It supervises all the hardware on a computer and monitors each device's status, including whether it's in use or not.
- It also checks whether the device is functioning properly or not.
- It also controls software resources of the computer.
- It controls how much memory is used by the computer, keeping track of which memory is free and which memory is being used by which software.
- It controls how a computer system's files and directories are organized.
- It keeps track of the amount of disk space used by a specific file.
- It allows you to create, copy, move and delete files.

Types of Operating Systems

The different types of operating systems are as follows:

Interactive (GUI-based) – An operating system that is user-friendly has a graphical user interface where commands can be entered by clicking, double-clicking, or right-clicking the mouse. Windows is the example of Interactive Operating System.

Single-user , single-task operating system – This kind of operating system only permits one person to use the computer at a time for one job.

Single-user, multi-task operating system – This kind of operating system is used on desktop and laptop computers, which allow one user to run multiple programmes simultaneously. Examples of single-user multitask operating systems are Windows and Apple MacOS.

Multi-user – A multi-user operating system enables multiple users to work on the same computer at different times or simultaneously.

Real Time – A computing environment that responds to input within a specific period of time. is known as a real-time operating system. It controls the computer's resources so that each operation is completed in exactly the same amount of time each time. Real-time operating systems include Lynx OS and Windows CE.

Distributed – A distributed operating system runs on a set of computers that are interconnected by a network. It combines the different computers in the network into a single integrated computer and storage location. Windows, UNIX, and LINUX are examples of distributed operating systems.

Menu, icons, and task bar on the Desktop

The components of Windows are as follows –

Taskbar – The long horizontal bar at the bottom of the screen is called the taskbar. The Start button is located to the left of the Taskbar, and Date/Time is located to the right. On the Taskbar, you can also see icons for open programmes and a few shortcuts.

Start button – It is located on the left of the taskbar. Clicking the Start button opens the Start menu and provides access to programs and features.
Recycle Bin – The user's deleted files and folders are kept in the Recycle Bin. You can restore accidentally deleted files or folders from the recycle bin.
Folder – Folders and directories are groups which contain single of multiple files. There may be related files and/or subfolders in each directory and folder. One or more files and other sub-folders may be located inside a sub-folder. This makes files easily accessible.

Apply Basic Skills for Care and Maintenance of Computer

Computer systems require maintenance in order to function properly. System failure may result from poor maintenance. You may be able to keep it in good working order by giving it routine care and maintenance. Installing updates, security, creating backups, and scanning are all part of routine system maintenance.
To keep the computer system's maintained you should follow the following activity –

1. Keep the computer dust free.
2. Do not eat or drink while working on the computer. Food or drink may spill on the system.
3. To keep the keyboard clean, make sure your hands are clean before using it.
4. CDs and DVDs should be handled carefully so that they do not get any scratches.
5. Keep keyboard covered when not in use.

Firewall
A computer firewall is a network security system, software, or programmable device that monitors and regulates incoming and outgoing network traffic in accordance with user-defined security rules.

Cookies
When you visit an internet website, a user's computer stores a little file known as a cookie on it. These files are used to store information personal to a given client and website.

Multiple choice questions

Q1. Which of the following functions is not performed using a mouse?
A) Turn on
B) Hover
C) Right-click
D) Drag and Drop
Ans: Turn on
Q2. What is the term used when you press and hold the left mouse key and move the mouse around?
A) Highlighting
B) Dragging
C) Selecting
D) Moving
Ans: Dragging

Q3. Which of the following is a valid file extension for Notepad file?
A) .jpg
B) .doc
C) .text (POST) starts
D) . txt
Ans: .txt

Q4. What should you do to ensure secure online transactions?
A) Lock your computer
B) Give credit card or bank details only on safe websites
C) Use anti-virus
D) Do not use pirated software
Ans: Give credit card or bank details only on safe websites

Q5. Which of the following trap small children into inappropriate relations?
A) Online predators
B) Worms
C) Trojan Horse
D) Anti-Virus
Ans: Online predators

Q6. What should a strong password consist of?
A) Only letters
B) Numbers and special characters
C) Name of a person
D) Letters, numbers and special characters
Ans: Letters, numbers and special characters

Q7. Shotcut key to open a find dialog box is
A) Ctrl+V
B) Ctrl+F
C) Ctrl+H
D) Ctrl+Z
Ans:Ctrl+H

Q8. The number of alignment present are possible in MS Word
A) 2
B) 4
C) 3
D)5
Ans: 4 (Left, Right, justify and centre)

Q9.Which of the following is essential for maintaining a keyboard?
A) Turn the keyboard upside down and shake it to remove foreign material.
B) Blow dust and other particles with help of a blower.

C) Use a very dilute combination of soap and water applied with a non-abrasive cloth to remove stains from the keycaps.
D) Cover the keyboard whenever not in use
Ans: Cover the keyboard whenever not in use

Answer the following Questions.

1. What is BIOS?
2. What is the purpose of Mouse?
3. What are files and folders in a computer system?
4. How to maintain a computer system?
5. How to increase Computer performance?
6. What is a Security Break?
7. How can we protect our data?
8. Explain in detail about threats in which personal information from a computer can be released without our knowledge.

CBSE | DEPARTMENT OF SKILL EDUCATION

ARTIFICIAL INTELLIGENCE (SUBJECT CODE - 417)

Sample Question Paper for Class X (Session 2022-2023)

Max. Time: 2 Hours **Max. Marks: 50**

General Instructions:

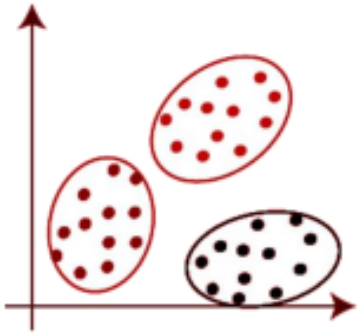
1. Please read the instructions carefully.
2. This Question Paper consists of **21 questions** in two sections: Section A & Section B.
3. Section A has Objective type questions whereas Section B contains Subjective type questions.
4. **Out of the given (5 + 16 =) 21 questions, a candidate has to answer (5 + 10 =) 15 questions in the allotted (maximum) time of 2 hours.**
5. All questions of a particular section must be attempted in the correct order.
6. **SECTION A - OBJECTIVE TYPE QUESTIONS (24 MARKS):**
    i. This section has 05 questions.
    ii. Marks allotted are mentioned against each question/part.
    iii. There is no negative marking.
    iv. Do as per the instructions given.
7. **SECTION B – SUBJECTIVE TYPE QUESTIONS (26 MARKS):**
    i. This section has 16 questions.
    ii. A candidate has to do 10 questions.
    iii. Do as per the instructions given.
    iv. Marks allotted are mentioned against each question/part.

SECTION A: OBJECTIVE TYPE QUESTIONS

Q. 1	**Answer any 4 out of the given 6 questions on Employability Skills (1 x 4 = 4 marks)**	
i.	Pranjali gets up at 5 am and goes to her badminton classes. Then she comes home and finishes her homework before going to school. She does this all by herself. No one tells her to do it. This is an example of (a) Self-motivation (b) External motivation (c) Both self and external motivation (d) Not any specific type of motivation	1
ii.	Which of the following can cause stress? (a) Yoga and meditation (b) Driving during rush hour (c) Organized academic life (d) Enjoying holidays with family	1
iii.	What is the term used when you quickly click the left mouse button twice? (a) Hover (b) Drag and drop (c) Double clicking (d) Moving	1
iv.	Ravi learnt that if a laptop gets overheated, the internal parts get damaged. What happens if he leaves his device plugged in even after it is charged 100%? (a) It can break (b) It can stop functioning (c) It can overheat (d) Data can get corrupt	1
v.	Srishti is a young woman who makes earrings. She buys jute from a farmer and makes earrings from that. She sees that most women in her village do not work. So, she hires two women to help her. As her orders increase, she hires three more women to work for her. How was she helping her village grow? (a) By selling earrings to women without a job (b) By purchasing earrings from the local market (c) By buying jute from the local farmer and by providing jobs to local women (d) By attracting the women in her village with her creative earrings	1
vi.	Mary has two people who work for her. Every day, she spends one hour with them to learn about what they've done that day. (a) Creates a new product (b) Divides income (c) Manages the business (d) Takes risks	1

Q. 2	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	
i.	_____ and _____ are AI based applications that help us in navigation.	1
ii.	"This type of intelligence measure's one's awareness of the natural world around them and their sensitivities to any changes that occur. It allows us to identify the variation among two different species and understand how they are related". Identify the type of intelligence described in the above sentence.	1
iii.	Identify the incorrect statement(s) from the following: (i) Deep learning is a subset of Machine Learning (ii) Machine Learning is a subset of Deep Learning (iii) Artificial Intelligence is a subset of Deep Learning (iv) Deep Learning is the advanced form of AI and ML (a) only (i) (b) (ii) and (iii) (c) (i) and (ii) (d) Only (iii)	1
iv.	Search engines not only predict what popular searches may apply to your query as you start typing, but it looks at the whole picture and recognizes what you're trying to say rather than the exact search words. This is an example of (a) Computer Vision (b) Data Sciences (c) Natural Language Processing (d) Natural Language Understanding	1
v.	When a user installs an app in the smartphone, it asks for access to gallery, contacts, etc. After accepting this, it gives the user agreement which most users accept without realizing the implications. What is the concern here? (a) Data Privacy (b) Unemployment (c) AI bias (d) No concern	1
vi.	We can't make "good" decisions without information. (True/False)	1

Q. 3	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	
i.	_____ helps us to summarise all the key points into one single Template so that in future, whenever there is a need to look back at the basis of the problem, we can take a look at this and understand the key elements of it.	1

ii.	Divya was learning neural networks. She understood that there were three layers in a neural network. Help her identify the layer that does processing in the neural network. (a) Output layer (b) Hidden layer (c) Input layer (d) Data layer	1
iii.	Smita is working on a project that involves over a lakh of records. Which of the following should she use to make the best project? (a) Traditional programming (b) Manual processing (c) IoT (d) Neural networks	1
iv.	For better efficiency of an AI project Training data should be _____ i) Relevant ii) Scattered iii) Structured iv) Authentic Choose the correct option: (a) Both i and ii (b) Both i and iv (c) Only i (d) Only iv	1
v.	The _____Sustainable Development Goals (SDGs) were launched at the United Nations Sustainable Development Summit in New York in the year 2015, forming the 2030 Agenda for Sustainable Development. (a) 17 (b) 15 (c) 13 (d) 19	1
vi.	 Identify the algorithm based on the given graph (a) Dimensionality reduction (b) Classification (c) Clustering (d) Regression	1

Q. 4	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	
i.	_____ helps in assigning a predefined category to a document, organize it in such a way that helps customers to find information they want. For example spam filtering in email, auto tagging on social media, categorization of news articles etc.	1
ii.	Which of the following is the type of data used by NLP applications? (a) Images (b) Numerical data (c) Graphical data (d) Text and Speech	1
iii.	Ayushi was learning about NLP. She wanted to know the term used for the whole textual data from all the documents altogether. Help her in identifying the term used for it.	1
iv.	What is the full form of TF-IDF?	1
v.	A corpus contains 12 documents. How many document vectors will be there for that corpus? a. 12 b. 1 c. 24 d. 1/12	1
vi.	*Identify the type of chatbot with the information given below:* These bots work on pre-programmed instructions inside the application/machine and are generally easy to develop. They are deployed in the customer care section of various companies. Their job is to answer some basic queries that they are coded for and connect them to human executives once they are unable to handle the conversation.	1

Q. 5	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	
i.	The output given by the AI machine is known as _____ (Prediction/ Reality)	1
ii.	_____ is used to record the result of comparison between the prediction and reality. It is not an evaluation metric but a record which can help in evaluation.	1
iii.	Raunak was learning the conditions that make up the confusion matrix. He came across a scenario in which the machine that was supposed to predict an animal was always predicting not an animal. What is this condition called? (a) False Positive (b) True Positive (c) False Negative (d) True Negative	1

iv.	Which two evaluation methods are used to calculate F1 Score? (a) Precision and Accuracy (b) Precision and Recall (c) Accuracy and Recall (d) Precision, F1 score	1
v.	Which of the following statements is not true about overfitting models? (a) This model learns the pattern and noise in the data to such extent that it harms the performance of the model on the new dataset (b) Training result is very good and the test result is poor (c) It interprets noise as patterns in the data (d) The training accuracy and test accuracy both are low	1
vi.	Priya was confused with the terms used in the evaluation stage. Suggest her the term used for the percentage of correct predictions out of all the observations. (a) Accuracy (b) Precision (c) Recall (d) F1 Score	1

SECTION B: SUBJECTIVE TYPE QUESTIONS

Answer any 3 out of the given 5 questions on Employability Skills (2 x 3 = 6 marks)
Answer each question in 20 – 30 words.

Q. 6	In SMART goals, what does 'A' stand for? Explain.	2
Q. 7	Sameera is always punctual at school. She has a regular schedule that she follows every day. She plans for study and play time in advance. Enlist the four steps Sameera must have followed for effective time management.	2
Q. 8	Enlist any two methods to protect our data on the computer.	2
Q. 9	What do entrepreneurs do when they run their business? Mention any two points.	2
Q. 10	Raj has a small convenience store in his locality. There are many other convenience stores in the area. Yet, Raj's store survives the competition and does well. Which stage of an entrepreneur's career process can you relate this to? Explain.	2

Answer any 4 out of the given 6 questions in 20 – 30 words each (2 x 4 = 8 marks)

Q. 11	How do you understand whether a machine/application is AI based or not? Explain with the help of an example.	2
Q. 12	If you do an image search for vacations on a popular search engine, the first few searches mostly return the picture of beaches. What is the concern here? Explain.	2

Q. 13	Suhana works for a company wherein she was assigned the task of developing a project using AI project cycle. She knew that the first stage was scoping the problem. Help her list the remaining stages that she must go through to develop the project.	**2**
Q. 14	What will be the results of conversion of the term, *'happily'* in the process of stemming and lemmatization? Which process takes longer time for execution?	**2**
Q. 15	What do we get from the "bag of words" algorithm?	**2**
Q. 16	People of a village are totally dependent on the farmers for their daily food items. Farmers grow new seeds by checking the weather conditions every year. An AI model is being deployed in the village which predicts the chances of heavy rain to alert farmers which helps them in doing the farming at the right time. Which evaluation parameter out of precision, recall and F1 Score is best to evaluate the performance of this AI model? Explain.	**2**

Answer any 3 out of the given 5 questions in 50– 80 words each (4 x 3 = 12 marks)

Q. 17	Ashwat is amazed to learn about his sister Ananya who is multi-talented and has excelled in academics, music, dancing, sports and painting. He was quite curious when Ananya told him that he too possessed all these intelligences like every human being does, but only at different levels. He wondered which intelligence she was talking about. Can you help Ashwat in learning about different types of intelligences by naming and explaining any four types of intelligences?	**4**
Q. 18	Samarth attended a seminar on Artificial Intelligence and has now been asked to write a report on his learnings from the seminar. Being a non-technical person, he understood that the AI enabled machine uses data of different formats in many of the daily based applications but failed to sync it with the right terminologies and express the details. Help Samarth define Artificial Intelligence, list the three domains of AI and the data that is used in these domains.	**4**
Q. 19	Neural networks are said to be modelled the way how neurons in the human brain behave. A similar system is mimicked by the AI machine to perform certain tasks. Explain how neural networks work in an AI model and mention any three features of Neural Networks.	**4**
Q. 20	Samiksha, a student of class X was exploring the Natural Language Processing domain. She got stuck while performing the text normalisation. Help her to normalise the text on the segmented sentences given below: Document 1: Akash and Ajay are best friends. Document 2: Akash likes to play football but Ajay prefers to play online games.	**4**

Q. 21	Automated trade industry has developed an AI model which predicts the selling and purchasing of automobiles. During testing, the AI model came up with the following predictions.	4

Confusion Matrix		Reality	
		Yes	**No**
Predicted	**Yes**	60	25
	No	05	10

(i) How many total tests have been performed in the above scenario?
(ii) Calculate precision, recall and F1 Score.

CBSE | DEPARTMENT OF SKILL EDUCATION

ARTIFICIAL INTELLIGENCE (SUBJECT CODE - 417)

MARKING SCHEME FOR CLASS X (SESSION 2022-2023)

Max. Time: 2 Hours **Max. Marks: 50**

General Instructions:

1. Please read the instructions carefully.
2. This Question Paper consists of **21 questions** in two sections – Section A & Section B.
3. Section A has Objective type questions whereas Section B contains Subjective type questions.
4. **Out of the given (5 + 16 =) 21 questions, a candidate has to answer (5 + 10 =) 15 questions in the allotted (maximum) time of 2 hours.**
5. All questions of a particular section must be attempted in the correct order.
6. **SECTION A - OBJECTIVE TYPE QUESTIONS (24 MARKS):**
   - i. This section has 05 questions.
   - ii. There is no negative marking.
   - iii. Do as per the instructions given.
   - iv. Marks allotted are mentioned against each question/part.
7. **SECTION B – SUBJECTIVE TYPE QUESTIONS (26 MARKS):**
   - i. This section contains 16 questions.
   - ii. A candidate has to do 10 questions.
   - iii. Do as per the instructions given.
   - iv. Marks allotted are mentioned against each question/part.

SECTION A: OBJECTIVE TYPE QUESTIONS

Q. No.	QUESTION	Source Material (NCERT/PSSCIVE/ CBSE Study Material)	Unit/ Chap. No.	Page no. of source material	Marks
Q. 1	**Answer any 4 out of the given 6 questions on Employability Skills (1 x 4 = 4 marks)**				
i.	(a) Self-motivation	Employability Skills NCERT	Unit 2 Self-Management Skills	**51**	**1**
ii.	(b) driving during rush hour	Employability Skills NCERT	Unit 2 Self-Management Skills	**41**	**1**
iii.	(c) Double clicking	Employability Skills NCERT	Unit 3 Information and communication Technology Skills	**68**	**1**
iv.	(c) It can overheat	Employability Skills NCERT	Unit 3 Information and communication	**78**	**1**

			Technology Skills		
v.	(c) By buying jute from the local farmer and by providing jobs to local women	Employability Skills NCERT	Unit 4 Entrepreneurial Skills	**87**	**1**
vi.	(c) Manages the business	Employability Skills NCERT	Unit 4 Entrepreneurial Skills	**94**	**1**
Q. 2	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i.	Google Maps, Ola, Uber (any relevant application name with similar functionality can be considered)	Facilitator Handbook	Unit 1	15	**1**
ii.	Naturalist Intelligence	Facilitator Handbook	Unit 1	11	**1**
iii.	(b) (ii) and (iii)	Facilitator Handbook	Unit 1	20	**1**
iv.	(c) Natural Language Processing	Facilitator Handbook	Unit 1	22	**1**
v.	(a) Data Privacy	Facilitator Handbook	Unit 1	25	**1**
vi.	True	Facilitator Handbook	Unit 1	12	**1**
Q. 3	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i.	Problem Statement Template	Facilitator Handbook	Unit 2	33	**1**
ii.	(b) Hidden layer	Facilitator Handbook	Unit 2	40	**1**
iii.	(d) Neural networks	Facilitator Handbook	Unit 2	41	**1**
iv.	(b) Both i and iv	Facilitator Handbook	Unit 2	34	**1**
v.	(a) 17	Facilitator Handbook	Unit 2	30	**1**
vi.	(c) Clustering	Facilitator Handbook	Unit 2	39	**1**
Q. 4	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i.	Text Classification	Facilitator Handbook	Unit 6	101	**1**
ii.	(d) Text and Speech	Facilitator Handbook	Unit 6	99	**1**
iii.	Corpus	Facilitator Handbook	Unit 6	108	**1**
iv.	Term Frequency Inverse Document Frequency	Facilitator Handbook	Unit 6	114	**1**
v.	(a) 12	Facilitator Handbook	Unit 6	113	**1**
vi.	Script bot	Facilitator Handbook	Unit 6	105	**1**
Q. 5	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i.	Prediction	Facilitator Handbook	Unit 7	119	**1**

ii.	Confusion Matrix	Facilitator Handbook	Unit 7	122	1
iii.	(c) False Negative	Facilitator Handbook	Unit 7	121	1
iv.	(b) Precision and Recall	Facilitator Handbook	Unit 7	127	1
v.	(d) The training accuracy and test accuracy both are low	Facilitator Handbook	Unit 7	119	1
vi.	(a) Accuracy	Facilitator Handbook	Unit 7	123	1

SECTION B: SUBJECTIVE TYPE QUESTIONS

Q. No.	QUESTION	Source Material (NCERT/PSSCIVE / CBSE Study Material)	Unit/ Chap. No.	Page no. of source material	Marks
Answer any 3 out of the given 5 questions on Employability Skills in 20 – 30 words each (2 x 3 = 6 marks)					
Q. 6	In SMART goals, A refers for Achievable, it means breaking down big goals into smaller parts will make the goal achievable. For example Bigger Goal: "I want to become a teacher in my school." Breaking it into smaller goals: Complete higher secondary Complete Graduation Complete B.Ed. Apply for jobs in the teaching field *(1 mark for identification; 1 mark for explanation)*	Employability Skills NCERT	Unit 2 Self-Management Skills	**Page 55, 56**	**2**
Q. 7	The four steps of effective time management which Sameera must have followed are: (i) Organise (ii) Prioritise (iii) Control (iv) Track *(½ mark for every step, ½ * 4 =2)*	Employability Skills NCERT	Unit 2 Self-Management Skills	**60**	**2**
Q. 8	Two methods to protect our data on the computer: 1. Use passwords to login to your computer. 2. Install Anti-virus and Firewall 3. Encrypt Data 4. Secure sites *(1 mark for each correct method, 1*2=2)*	Employability Skills NCERT	Unit 3 Information and communication Technology Skills	**81, 82**	**2**

Q. 9	I. Fulfill Customer Needs II. Use Local Materials III. Help Society IV. Create Jobs V. Sharing of Wealth VI. Lower Price of Products *(1 mark for each correct point, 1*2=2)*	Employability Skills NCERT	Unit 4 Entrepre-neurial Skills	**86, 87**	**2**
Q. 10	This stage is the Survive stage of an entrepreneur's career process. In this stage, even if there are many entrepreneurs in the market, the new entrepreneur has to remain in a competitive market. *(1 mark for mentioning the stage; 1 mark for correct explanation)*	Employability Skills NCERT	Unit 4 Entrepre-neurial Skills	**100**	**2**
Answer any 4 out of the given 6 questions in 20 – 30 words each (2 x 4 = 8 marks)					
Q. 11	Any machine that has been trained with data and can make decisions/predictions on its own can be termed as AI. Eg:The bot or the automation machine is not trained with any data is not an AI while a chatbot that understands and processes human language is an AI. *(1 mark for correct explanation; ½ mark for example of AI; ½ mark for example of not AI)*	Facilitator Handbook	Unit 1	**16, 17**	**2**
Q. 12	In the given scenario, we are concerned about the bias. When we talk about a machine, we know that it is artificial and cannot think on its own. It can have intelligence, but we cannot expect a machine to have any biases of its own. Any bias can transfer from the developer to the machine while the algorithm is being developed. *(1 mark for mentioning the term bias; 1 mark for the correct explanation)*	Facilitator Handbook	Unit 1	**26**	**2**

Q. 13	Steps of AI project life cycle: 1. Data Acquisition 2. Data Exploration 3. Modelling 4. Evaluation *(½ mark for mentioning each stage, ½ *4=2)*	Facilitator Handbook	Unit 2	**29**	**2**
Q. 14	Stemming Lemmatization happily happi happy Process that takes longer time for execution is lemmatization *(½ marks each for identifying the correct stem and lemma; 1 mark for identifying the correct process)*	Facilitator Handbook	Unit 6	**110, 111**	**2**
Q. 15	Bag of words gives us two things: 1. A vocabulary of words for the corpus 2. The frequency of these words (number of times it has occurred in the whole corpus) *(1 mark for each point)*	Facilitator Handbook	Unit 6	**112**	**2**
Q. 16	Let us take each of the factor into consideration at once, If precision is considered, FN cases will not be taken into account, so it will be of great loss as if the machine will predict there will be no heavy rain, but if the rain occurred, it will be a big monetary loss due to damage to crops. If only recall is considered, then FP cases will not be taken into account. This situation will also cause a big amount of loss, as all people of the village are dependent on farmers for food, and if the model predicts there will be heavy rain and the farmers may not grow crops, it will affect the basic needs of the people. Hence F1 Score is the best suited parameter to test this AI model, which is the balance between Precision and Recall. *(1 mark for identifying the term F1 score; 1 mark for relevant explanation)*	Facilitator Handbook	Unit 7	**126, 127**	**2**
Answer any 3 out of the given 5 questions in 50– 80 words each (4 x 3 = 12 marks)					
Q. 17	All humans possess 9 types of intelligence but at different levels. They are: 1. Mathematical Logical Reasoning: ability to regulate, measure, and understand numerical symbols, abstraction and logic. 2. Linguistic Intelligence: Language processing skills both in terms of	Facilitator Handbook	Unit 1	**11**	**4**

	understanding or implementation in writing or verbally. 3. Spatial Visual Intelligence : ability to perceive the visual world and the relationship of one object to another. 4. Kinesthetic Intelligence : ability that is related to how a person uses his limbs in a skilled manner. 5. Musical Intelligence : ability to recognize and create sounds, rhythms, and sound patterns. 6. Intrapersonal Intelligence : Describes how high the level of self-awareness someone has is. Starting from realizing weakness, strength, to his own feelings. 7. Existential Intelligence : An additional category of intelligence relating to religious and spiritual awareness. 8. Naturalist Intelligence : An additional category of intelligence relating to the ability to process information on the environment around us. 9. Interpersonal intelligence : ability to communicate with others by understanding other people's feelings & influence of the person. *(½ mark for the naming the intelligence; ½ mark for the explanation of the same; (½ + ½) * 4 = 4)*				
Q. 18	Artificial Intelligence (AI) refers to any technique that enables computers to mimic human intelligence i.e., make decisions, predict the future, learn and improve on its own. With respect to the type of data fed in the AI model, AI models can be broadly categorised into three domains: 1. Data sciences 2. Computer vision 3. Natural Language Processing Data Science takes input in the form of numeric and alphanumeric data. Computer Vision takes input in the form of images and videos. Natural Language Processing takes input in the form of text and speech. *(1 mark for definition of AI; ½ mark each for the names of the domains; ½ mark each for the type of data input to domains)*	Facilitator Handbook	Unit 1	**21**	**4**

Q. 19	Neural networks are loosely modelled after how neurons in the human brain behave. The features of a neural network are : 1. They are able to extract data features automatically without needing the input of the programmer. 2. A neural network is essentially a system of organizing machine learning algorithms to perform certain tasks. 3. It is a fast and efficient way to solve problems for which the dataset is very large, such as in images. *(1 mark for how neural networks are modelled; 1 mark each for relevant feature of neural network)*	Facilitator Handbook	Unit 2	**40, 41**	**4**
Q. 20	**1. Tokenisation** Akash, and, Ajay, are, best, friends Akash, likes, to, play, football, but, Ajay, prefers, to, play, online, games **2. Removal of stopwords** Akash, Ajay, best, friends Akash, likes, play, football, Ajay, prefers, play, online, games **3. converting text to a common case** akash, ajay, best, friends akash, likes, play, football, ajay, prefers, play, online, games **4. Stemming/Lemmatisation** akash, ajay, best, friend akash, like, play, football, ajay, prefer, play, online, game *(1 mark for each step; 1*4=4)*	Facilitator Handbook	Unit 6	**108 - 111**	**4**
Q. 21	(i) TP=60, TN=10, FP=25, FN=5 60+25+5+10=100 total cases have been performed (ii) **(Note: For calculating Precision, Recall and F1 score, we need not multiply the formula by 100 as all these parameters need to range between 0 to 1)** Precision =TP/(TP+FP) =60/(60+25) =60/85 =0.7	Facilitator Handbook	Unit 7	**124-127**	**4**

	Recall=TP/(TP+FN) =60/(60+5) =60/65 =0.92 F1 Score=2*Precision*Recall/ (Precision+Recall) =2*0.7*0.92/(0.7+0.92) =0.79 *(1 mark for total number of cases; 1 mark each for the calculation of precision, recall and F1 score)*				