Class 10

Answer Key

Robotics & Artificial Intelligence (Ver 1.0)

Part 2: Artificial Intelligence (AI)

1. Decision Making in Machines/Computers

Task (Page 133)

Accept all relevant answers

Reboot (Page 139)

1. Machine learning can be used to train machines to learn from data.
2. Data features refers to the type of data that you want to collect. For example, a student's data's features would be his name, marks, grade, address etc.

Task (Page 139)

Do Yourself

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Quiz

A. 1. a 2. d 3. b 4. a 5. d

B. 1. Machine Learning 2. Natural Language Processing
3. Application Programming Interface
4. Observations 5. Train

C. 1. False 2. True 3. False 4. False 5. True

D. 1. e 2. d 3. a 4. b 5. c

SECTION B (Subjective Type Questions)

A. 1. Decision making is the process of comparing our different alternatives and coming to a conclusion on what exactly we want to do. It is a process of selection of option which is more satisfactory than other options. Our brain plays a very important role in making all types of decisions to deal with different problems in life.

2. The Model selection or Model building is determined based on the outcome you want to achieve. It is build using various analytical techniques of machine learning which are best suited for the task at hand, whether it is to do with speech recognition, numerical data, text data, prediction etc.

3. We train the model using the data prepared for training and allow the Model/Algorithm to process it so that it understands the patterns, features and rules to be able to predict. The further training helps the model to predict more accurately over the period of time and get closer to completing the task, it is designed to do.

4. The Testing data is used to check the accuracy of the Model's prediction. The evaluation of the results and further, Tuning of the algorithm helps the model to achieve complete accuracy in predicting.

B. 1. Machine Learning is an application of Artificial Intelligence(AI) that enables systems to learn and improve automatically from experience without the need for explicit programming. It focuses on the development of computer programs that can access data and use it to learn.

Machine learning is a subset of AI that uses statistical methods to enable machines to improve decision making with experience. It is the science of getting machines to interpret, process and analyse data in order to solve problems. It provides us statistical tools to explore the data.

Machine learning has a subset of Deep Learning that is inspired by the functionality of our brain cells called neurons which lead to the concept of artificial neural networks. Neural networks are implemented on a high dimensionality data to gain insight and form solutions.

2.

Machine Learning	Deep Learning
1. In machine learning, systems learn without being programmed to do so.	1. In Deep learning, systems are such that computation of Multi-Layer neural network is feasible.
2. Machine learning is a subset of AI that uses statistical methods to enable machines to improve decision making with experience.	2. Deep Learning is a subset of Machine Learning that is inspired by the functionality of our brain cells called neurons which leads to the concept of artificial neural networks.

3. Data is critical for machine learning to work, the more data the machine is given, the more accurate is its prediction.	3. Neural networks are implemented on high dimensional data to gain insights and form solutions.

3. • **Decision making in humans:** The decision making in humans is subjective and is based on sentiments, feelings, beliefs etc, which are defined by ethics, morals and values followed by an individual. Due to the fact that each individual is different, the decision making on an issue is not the same by different individuals. Humans still have a bias of subjectivity.
   • **Decision-making in machines:** The decision making in machines is defined by learning algorithms which are objective and are programmed to be based on consequence and factual information. Machines objectivity is based on actual data with no subjectivity bias, in Decision Making, though machine learning is helping to bridge the gap between the two.
4. Some of the ways that programming and algorithm can be used to teach machines subjective decision making are as follows:
   • **Machine learning:** Machine identifies the patterns with the large amount of data fed into it. Then machine can make predictions. Subjective decision making is taught to machine by feeding data that includes both the objective of a situation and the subjective feelings of the people involved.
   • **Natural Language Processing (NLP):** It teaches the machine to understand the nuances of human language like the emotional content of words and phrases. By understanding human language, machines can be taught to make subjective decisions by taking into account the subjective feelings of the people involved in a situation.
   • **Programming:** Programming can be used to create algorithms that define the rules that machines will use to make decisions. These rules can be based on the objective facts of a situation, the subjective feelings of the people involved, or a combination of both.
5. Teaching Machines/Computers, as to how to make decisions, is different from teaching humans. There is a huge amount of data that needs to be processed to reach the relevant outcome, so subjective decision making(decision making based on experience and Intuition) can happen. The instructions to the machines are given in the form of algorithms/programs which are understood by machines and accordingly processed. However, programming and algorithms can be used to create models that can learn to make subjective decisions which gives computers the capability of making decisions like humans i.e. AI.

C. Competency-based/Application-based questions:

1. d
2. b

Deep Thinking (Page 145)

1. Do Yourself

2. Location, Web search history, etc and add more by yourself

 **Lab Activity** (Page 145)

Do yourself.

2. Machine Intelligence and Cybersecurity in Computers

 **Task** (Page 149)

Accept all relevant answers

 **Reboot** (Page 150)

1. Human Intelligence comes from the complex structure and processes of the human brain, while machine intelligence is created by programming computers and using algorithms.
2. Malware, Ransomware, Phishing

Exercise

 **Unsolved Questions**

SECTION A (Objective Type Questions)

Quiz

A.	1.	d.	2.	b.	3.	a.	4.	a.	5.	a.
B.	1.	Machine Intelligence	2.	Humans	3.	Alan Turing's			
	4.	Cyber Security	5.	Unethical					
C.	1.	False	2.	True	3.	False	4.	True	5.	False
D.	1.	c.	2.	e.	3.	d.	4.	a.	5.	b

Section B (Subjective Type Questions)

A. 1. Cyberspace is an unreal, non physical, virtual complex environment on the Internet where software, hardware, and people interact by means of technology through devices and network connections on it.

2. Stealing of software media, illegally registering/activating/copying a program, or purposefully erasing a program, and/or any such activity of using or working with software for which one does not have ownership or authority to use.

IMPRINT 1

(This question was printed incorrectly in the book. Please correct it in your textbook.)

Q3. What are the measures that can be used to prevent unauthorized use?

3. To prevent unauthorized use, security measures like strong passwords, authentication methods, and Physical locks should be implemented.

B. 1. The applications/uses of Turing test are as follows:

Humans can be biased in judgements but with the Turing test in controlled procedures and environment with hidden participants details proves to be unbiased and accurate. This will be in the form of a quiz where some abstract or emotional questions will be ask and the answers to these questions will often be judged based on the type of the answer given.

CAPTCHA is one type of Turing Test to find out whether the website which is required to be accessed, is by a human or a computer. In this test a person is supposed to answer a question based on the set of images displayed.

2. Human Intelligence and Machine Intelligence are different based on following heads:

Origin: Human intelligence comes from the complex structure and processes of the human brain, while machine intelligence is created by programming computers and using algorithms.

Learning: Humans can learn naturally from their experiences and interactions, while machines learn by following programmed instructions and analyzing data.

Awareness: Humans are conscious beings with feelings and self-awareness, but machines don't have consciousness or emotions—they operate based on instructions.

Creativity: Humans can come up with new ideas and be imaginative, while machines rely on predefined rules and patterns and don't have their own creative abilities.

Adaptability: Humans understand social dynamics, emotions, and build relationships, while machines can simulate human-like responses but don't truly understand or have emotions.

Social Skills: Humans understand social dynamics, emotions, and build relationships, while machines can simulate human-like responses but don't truly understand or have emotions.

Senses: Humans have various senses like sight, hearing, touch, taste, and smell, which help gather information. Machines have limited sensors and need specific data inputs to make decisions.

Context: Humans understand the context of situations, considering cultural, historical, and situational factors. Machines require explicit programming to consider context and lack human-like understanding.

(This question was printed incorrectly in the book. Please correct it in your textbook)

Q3. What is the importance of Turing Test?

3. Importance of Turing Test:

Turing test finds its great importance when it can be used to find out how advanced computer AI is nowadays. If we can believe the results of the Turing Test then its accuracy is the best method to judge the advancement of a computer's artificial intelligence which can prove to be an achievement in the field of advancement in Computer Artificial Intelligence.

C. Competency-based/Application-based questions:

She should not click on such links. She should Block the sender of such an e-mail or report it as spam because the people sending such mails are "frauds" and may cause financial harm or leakage of personal data to inappropriate sources.

Deep Thinking (Page 157)

Do yourself.

Lab Activity (Page 157)

Do yourself.

3. Components of AI Project Framework

Task (Page 159)

Accept all relevant answers

Reboot (Page 166)

Five ways of acquiring data for an AI project are as follows:

1. Surveys: Data can be collected from online surveys, telephonic surveys or in-person surveys and collect responses. Surveys are a way of collecting data from a group of people in order to gain information and insights into various topics of interest.
2. Web Scraping: Data or information can also be extracted from a website. Web scraping or Data scraping is the method of downloading information from the World Wide Web.
3. Sensors: Data can also be collected from various sensors like collecting environmental data and storing it in some data storage solutions
4. Cameras: Data can be seen, written down or recorded onto the computer. Cameras are used to collect data in the form of images.
5. Observations: It is a method of collecting data by watching facts as they occur. Using the observation technique, data can be analyzed and used for testing the model.

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Quiz

A. 1. d 2. b 3. c 4. d 5. a

IMPRINT 1

6. b 7. b

B. 1. Evaluation 2. Dimensionality Reduction

3. Clustering and Dimensionality Reduction

C. 1. True 2. True 3. False

Section B (Subjective Type Questions)

A. (The following are the short answer type questions. Please correct it in your book)

1. Two different approaches for AI modeling are:

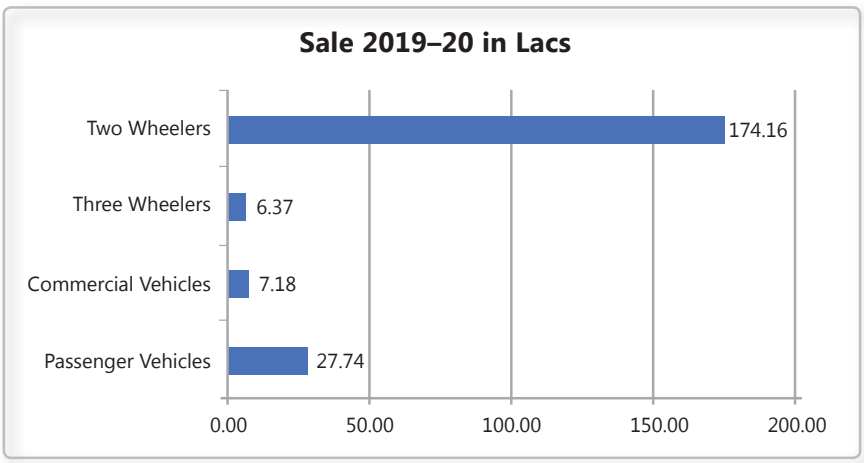
   a. Rule based Approach

   This approach is based on a set of rules and facts defined by the developer and fed to the machine to perform its task accordingly to generate the desired output. These models can operate with simple basic information and data. For example, If we have an AI model to predict whether the tiger would be visible or not, we feed the data of parameters such as cloud cover, temperature, wind speed, humidity etc with the favourable conditions of tiger visibility. Testing could be done with a scenario of the cloud cover, temperature, wind speed and humidity and based on the match of information, model would tell if the tiger would be visible or not.

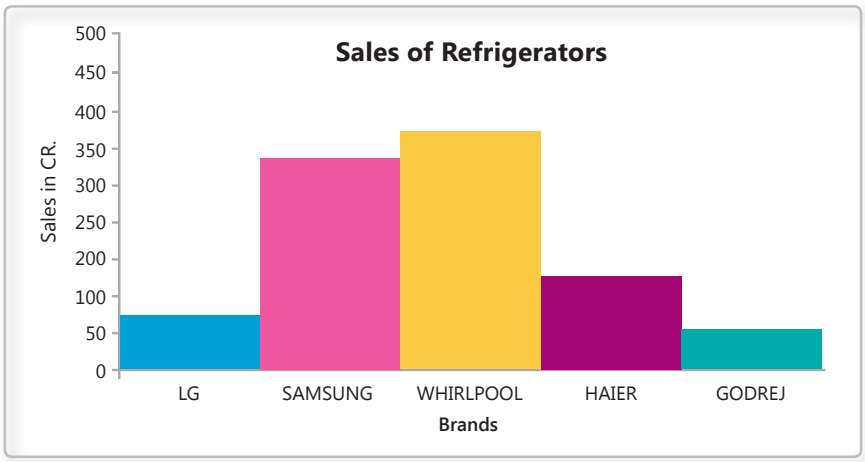
   b. Learning-Based Approach

   This approach refers to the model where the relationship or patterns in the data are not defined by the developer. Random data is fed into the machine and the machine develops its own pattern or trends based on data inputs. For example, suppose you have a dataset of 1000 images of flowers without their names, then a learning-based model might Cluster the data based on colour, size, shape, etc, and show you some groups.

2. Bar Graphs: Graph that represents data with rectangular bars with heights and length proportional to the values that they represent.



Histogram: Graphs are similar to Bar Graphs, which represent categorical data with rectangular bars with heights and lengths proportional to the values that they represent placed grouped together.



3. Data collected from open-sourced websites hosted by the government are one of the most reliable and authentic sources of information. These portals have information collected in suitable format that can be downloaded. Some of the open-sourced government portals are data.gov.in, india.gov.in, etc. Few other means for collecting authentic data are as follows

   Surveys: Data can be collected from online surveys, telephonic surveys or in-person surveys and collect responses. Surveys are a way of collecting data from a group of people in order to gain information and insights into various topics of interest. The process involves asking people for information through questionnaires which can be online or offline

   Cameras: Data can be seen, written down or recorded onto the computer. Cameras are used to collect data in the form of images. CCTV, web cameras and surveillance cameras are big sources of visual data that can be acquired from various places.

4. **The 4Ws Problem Canvas**

   To understand step by step how problem scoping is done a method is used, known as 4Ws Problem Canvas. This canvas helps us in identifying parameters we need to know for solving a problem. The 4Ws here are listed as Who?, What?, Where?, and Why?

   Who?

   The "Who" block helps in analysing the people getting affected directly or indirectly due to it. Under this, we find out who are the 'Stakeholders' to this problem and what we know about them. Stakeholders are the people who face this problem and would be benefited with the solution.

   What?

   Under the "What" block, you need to look into what you have on hand. At this stage, you need to determine the nature of the problem. What is the problem and how do you know

that it is a problem? Under this block, you also gather evidence to prove that the problem you have selected actually exists. Newspaper, articles, Media, announcements, etc. are some examples.

Where?

Now that you know who is associated with the problem and what the problem actually is; you need to focus on the context/situation/location of the problem. This block will help you look into the situation in which the problem arises, the context of it, and the locations where it is prominent.

Why?

You have finally listed down all the major elements that affect the problem directly. Now it is convenient to understand who the people that would be benefited by the solution are; what is to be solved; and where will the solution be deployed. These three canvases now become the base of why you want to solve this problem. Thus, in the "Why" canvas, think about the benefits which the stakeholders would get from the solution and how it will benefit them as well as the society.

5.

Rule-Based AI modelling	Learning-Based AI modelling
1. This approach is based on a set of rules and facts defined by the developer	1. This approach refers to the model where the relationship or patterns in the data are not defined by the developer.
2. These models can operate with simple basic information and data.	2. The machine develops its own patterns by using Random Data
3. These models are static as once trained the machine does not take into consideration any changes made in the original training dataset.	3. These models are dynamic, they improve upon any changes made on the training dataset.

B. (The following are short answer type questions . Please correct it in your book)

1. Data Exploration refers to exploring the large data to uncover the patterns or trends needed for the AI project.

   Data Exploration is important because it is considered to be the first step in data analysis where unstructured data is explored, researched, filtered and visualized to decide the strategy for the type of model used in the later stage.

2. Visualization of the data plays a very important role in data analysis. This visualization process has to be carried in some user-friendly format so that you can:
   - 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.

3. Reinforcement learning is a type of learning-based approach where a machine learning algorithm enables an agent (machine with an intelligent code) to learn in an environment to find the best possible behaviour or path it should take by performing certain actions that maximize the total cumulative reward of the agent.

   In this learning approach the agent learns automatically by using hit and trial methods or through its own experience using rewards and penalties. Each action performed by an agent gives reward for correct move and it signals positive feedback. For wrong move it generates negative feedback and gets punishment and a penalty.

   The agent explores the environment by interacting with it freely so that it is able to improve the performance by getting the maximum positive rewards.

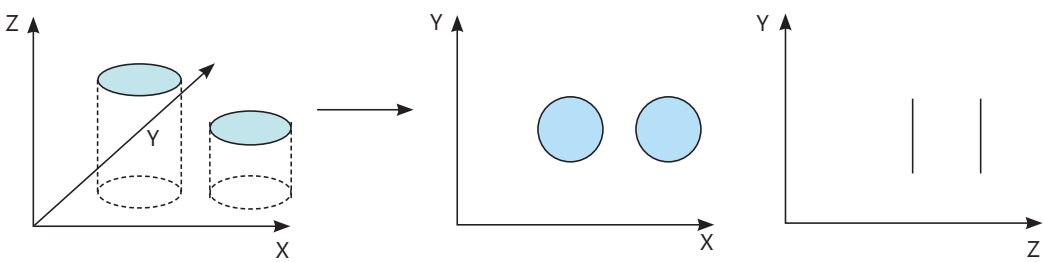
   The best applications of reinforcement learning are self-driving cars, robotics and a variety of video games available these days.

4. **Dimensionality Reduction**

   Humans can visualize any figure 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 considered to be N-Dimensional entities, which means that we cannot visualise them as they exist beyond our visualization ability. Hence, to make sense out of it, we need to reduce their dimensions which we do by using dimensionality reduction algorithm.

   As we reduce the dimension of an entity, the information which it contains starts getting distorted. For example, if we have a ball in our hand, it is 3-Dimensional right now. But if we click its picture, the data transforms to 2-D as an image which is a 2-dimensional entity. Now, as soon as we reduce one dimension, at least 50% of the information is lost as now we will not know about the back of the ball.

   Whether the ball was of the same colour at the back or not? Or was it just a hemisphere? If we reduce the dimensions further, more and more information will get lost. So, we use Dimensionality Reduction here which reduces the dimensions and makes it sensible data.



C. Competency-based/Application-based questions:

4W problem Canvas

Who

1. People facing water scarcity. Those whose health is getting affected by water scarcity
2. Governments of the countries facing water scarcity or might face water scarcity in the near future. They have the responsibility of fulfilling the needs of their population.

What

1. Increasing Water scarcity
2. Challenges for Water Supply System to fulfill the demands of the growing population as water is limited by the need is growing everyday.
3. 2 billion people living in water scarce conditions

Where

1. Many water scarce countries are not able to meet water needs of its citizens.
2. This problem is not location-specific, it is bound to increase in other geographical locations of the world.

Why

1. This problem needs to be solved to prevent water-borne diseases and promote healthy lifestyle for the world
2. The limited resource "water" has to be equitably distributed to the people of the world so that a War over Water is prevented.

* You can add your own ideas to the above 4W's canvas

Deep Thinking (Page 182)

Do yourself.

Lab Activity (Page 182)

Do yourself.

4. Introduction to Data and Programming with Python

Task (Page 187)

Do Yourself

Task (Page 198)

a. f2.loc[22]=['mohit',89] (This question was printed incorrectly in the book. Please correct it in your textbook.)

Ans.

	Name	Marks
11	Riya	92
22	mohit	89
33	Sneha	89

b. f2[:]=0

Ans.

	Name	Marks
11	0	0
22	0	0
33	0	0

c. f2.loc[33]=0

Ans.

	Name	Marks
11	Riya	92
22	Sonali	90
33	0	0

Reboot (Page 213)

1. Libraries in Python are collections of precompiled code, functions, or resources that provide additional functionality to python developers.
2. Matplotlib was created by John D. Hunter in 2003.
3. Markers are the points on the graph that represent a data value on a line or scatter chart.

Task (Page 215)

- print(word[:1:-2])

  ['N', 'I', 'A', 'U']

- print(word[-1:])
  ['E', 'D', 'U', 'C', 'A', 'T', 'I', 'O']
- print(word[:-1])
  ['E', 'D', 'U', 'C', 'A', 'T', 'I', 'O']

Task (Page 224)

```
Txt="NATURE"
for i in range(len(Txt)):
      print(i, end="@")
```

Ans. 0@1@2@3@4@5@

Task (Page 229)

a. S[-9:-6]

Ans. EDU

b. S[3:-3]

Ans. CAT

c. S[7:-5:-1]

Ans. OIT

d. S[:1:-2]

Ans. NIAU

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Quiz

A.

1. d	2. c	3. a	4. b	5. b
6. c	7. d	8. b	9. c	10. a

B.

1. Negative/Backward	2. Different	3. clear()	4. comma
5. Forward	6. sort()	7. max()	8. Slicing
9. Package	10. isupper()	11. String Slicing	12. in, not in

C.

1. True	2. False	3. False	4. True	5. True	6. True
7. False	8. True	9. False	10. True	11. True	12. False

Section B (Subjective Type Questions)

A. 1. This function sorts the list in ascending or descending order. This is done "in the list itself" and works for the list with values of the same data types. For example,

```
city=["Delhi", "Mumbai", "Kolkata", "Chennai"]
city.sort() #sorts the list by default in ascending order
print(city)
Output: ["Chennai", "Delhi", "Kolkata", "Mumbai"]
```

2. Key features of python:
   a. Easy to Code: Python is a high level level language but it is easy to learn as compared to other popular languages like C, C++, Java.
   b. Free and Open Source: Python can be easily modified and re-distributed. It can be downloaded from the official Python website.
   c. Robust Standard Library: Programmers don't have to write the entire code for every single thing unlike other programming languages. There is also a growing collection of thousands of thousands of reusable components.
   d. Interpreted: When a programming language is interpreted, it means the source code is executed line by line and not all at once, so that error correction is done one by one.
   e. Support for GUI: Python offers various toolkits such as Tkinter, Jpython etc, which allows for GUI's easy and fast development.
3. False
4. A tuple is a sequence of values enclosed in parentheses and its indices start with 0. Unlike list, tuple cannot be changed which means it is immutable.
5. To create a tuple with zero element.

```
emptyTuple=()
To create a tuple with zero element.
Mytuple=("num1",)
```

6.
```
import pandas as pd
emd=pd.DataFrame(index = range(3), columns=['c1','c2','c3'])
emd[:]=0
print(emd)
```

7.
```
pip install pandas
```

B. 1. Important Features of Lists

It is mutable data type.

It is an ordered sequence of values.

Each element is separated by comma and enclosed in square brackets [ ].

Each value/element is accessed by an index number.

The values can be added, modified or deleted by the user throughout the program.

It stores the values of different data types.

2. We can remove elements from the list by passing the value of the item to be deleted as the parameter to remove the () function.

```
lst = ['Iris', 'Orchids', 'Rose', 'Lavender', 'Lily', 'Carnations']
print("Original List is :", lst)
# using remove()
lst.remove('Orchids')
print("After deleting the item :", lst)
```

We can remove elements from the list using Del(). Items of the list can be deleted using the del statement by specifying the index of the item (element) to be deleted.

```
lst = ['Iris', 'Orchids', 'Rose', 'Lavender',
    'Lily', 'Carnations']
print("Original List is :", lst)
# using del statement to delete item (Orchids at index 1) from the
list
del lst[1]
print("After deleting the item :", lst)
```

We can remove elements from the list using pop(). The pop() is also a method of listing. We can remove the element at the specified index and get the value of that element using pop().

```
lst = ['Iris', 'Orchids', 'Rose', 'Lavender', 'Lily', 'Carnations']
print("Original List is :", lst)
# using pop() to delete item ('Orchids' at index 1) from the list
a = lst.pop(1)
print("Item popped :", a)
print("After deleting the item :", lst)
```

3. To access values in a tuple, use the square brackets along with the index number for reference. So, you can access the tuple element just like you access a list's or string's element.

For example

```
t1=("hi","hello","how","are","you")
t2=(2,3,5,6,8,7)
print(t1[3])
print(t2[2])
```

4.

List	Tuple
A list is a sequence of multiple values in an ordered sequence.	A tuple is a collection of objects which is ordered.
List is enclosed in square brackets [].	Tuples are enclosed in parenthesis ().
Elements of the list can be changed.	Elements of the tuple cannot be changed.
List has the variable length.	Tuple has the fixed length.
List is mutable.	Tuple is immutable.
List can hold only homogeneous values.	Tuple can hold both homogeneous and heterogeneous values.

5. Same as Q3

C. Competency-based/Application-based questions:

c. Adds 'Eve to the end of the list

D. What will be the output of the following programs?

1. (3,4,6,7)
2.
```
tup1=('sst','chemistry',2010,2022);
tup2=(1,2,3,4,5);
print("tup1[0]: ",tup1[0]);
print("tup2[1:5]: ",tup2[1:5]);
```
(This question was printed incorrectly in the book. Please correct it in your textbook.)

Ans tup1[0]: sst

tup2[1:5]: (2, 3, 4, 5)

3. (10,20,30,10,20,30,10,20,30)
4. Sanjay

   Ajay

   7020

   400

Lab Activity (Page 241)

1. a.
```
list1=["we","are","programming","a","code","for","today"]
num=len(list1)
for i in range(0,num-1,2):
 list1[i],list1[i+1]=list1[i+1],list1[i]
print(list1)
```

b.
```
l1=eval(input("enter a list of 5 cities"))
name=input("enter a name you want to search ")
for i in range(len(l1)):
    if(name==l1[i]):
        print(" city found at index ",i)
```

c.
```
l1=[30,40,50,60,45]
sum1=0
for i in range(len(l1)):
    sum1=sum1+l1[i]
avg=sum1/(len(l1)+1)
print(avg)
```

d. Do Yourself

e.
```
marks=[40,57,23,34,37,59]
for i in range(len(marks)):
  if(marks[i]>50):
     print(marks[i])
```

2.
```
es = (5000, 7020, 400, 800)
print(max(es))
```

3.
```
tup=('o','r','a','n','g','e')
  for i in range(len(tup)):
      if(tup[i]=='a' or tup[i]=='e'):
          continue
      else:
                  print(tup[i])
```

4. Do Yourself

Class Activity

page 242

Do Yourself