PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE

FIRST SEMESTER EXAMINATIONS - 2022

FOURTH YEAR BACHELOR OF SCIENCE IN COMPUTER SCIENCE

CS414 - ADVANCED TOPICS

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES

1. Write your student number and name clearly on the front of the answer booklet.
2. You have 10 minutes to read this paper. You must not write during this time.
3. **There are two (2) parts to the exam. You should attempt all the questions.**
4. All the answers must be written in the answer booklet. No other written materials will be accepted.
5. Put the answers for Questions 1 to 30 on one page of the answer booklet. Start the answer for each question, beginning with Question 31, on a new page.
6. Do **not** use red pen or pencil to write your answers.
7. **MOBILE PHONES MUST BE SWITCHED OFF** for the entire duration of the examination. Students failing to do so will be penalised.

MARKING SCHEME

Marks are indicated at the beginning of each question. Total is **100 marks**.

PART A: MULTIPLE CHOICE [1 MARK EACH = 30 MARKS]

Choose A or B or C or D from the alternatives given and write your choice in the answer booklet.

Question 1

Matplotlib's main toolkit used for geographic data visualization is _____

(A) NumPy. (B) Basemap. (C) Seaborn. (D) Scikit.

Question 2

A python data visualization library based on Matplotlib which produces informative statistical graphs is _____

(A) NumPy. (B) Basemap. (C) Seaborn. (D) Scikit.

Question 3

In data mining, a set of rules that are intended to be interpreted in a sequence is called a _____

(A) Decision list. (B) Decision tree. (C) Decision map. (D) Decision structure.

Question 4

In order to display x-axis label on a pyplot, which of the following functions can be used to add this label onto the plot.

(A) x-label() (B) xlabel() (C) x.label() (D) x:label()

Question 5

Which of the functions will create a pyplot title for a plot?

(A) name() (B) head() (C) title() (D) label()

Question 6

Which is the correct function to use in pyplot to draw points (markers) in a diagram.

(A) plt() (B) plot() (C) pyplot() (D) dplot()

Question 7

To determine how many items are in a dictionary, use the _____ function.

(A) count() (B) counter() (C) len() (D) length()

Question 8

Which method is used to return the value of a specified key in a dictionary?

(A) keys() (B) values() (C) get() (D) items()

Question 9

Which method returns a list of all the values in a dictionary?

(A) keys() (B) values() (C) get() (D) items()

Question 10

Which method returns a list containing a tuple for each key value pair of a dictionary?

(A) keys() (B) values() (C) get() (D) items()

Question 11

From the code shown below, how many dimensions are in the array?

```
arr = np.array([[1, 2, 3], [4, 5, 6]])
```

(A) 1 (B) 2 (C) 3 (D) None.

Question 12

Which of the symbols shown is used to construct a python tuple?

(A) [ ] (B) { } (C) < > (D) ( )

Question 13

Many of the operations that work on python strings also work for lists. Which operator concatenates a list?

(A) * (B) + (C) & (D) %

Question 14

Which method adds a new element to the end of a python list?

(A) append() (B) insert() (C) extend() (D) push()

Question 15

L1 and L2 are two lists. With the code *L1.extend(L2)* which list will be changed?

(A) Both L1 and L2 will change.
(B) Only L1 will change.
(C) Only L2 will change.
(D) Both L1 and L2 will not change.

Question 16

Name the python library that is used to analyze data.

(A) Matplotlib. (B) Pandas. (C) Tensorflow. (D) NumPy.

Question 17

What would the python code below return?

```
print(df.loc[[0, 1]])
```

(A) Series. (B) Tuple. (C) Dictionary. (D) DataFrame.

Question 18

What is the pandas alias?

(A) pa. (B) pn. (C) ps. (D) pd.

Question 19

What is the correct syntax to return the last 20 rows of a DataFrame?

(A) df.tail(20) (B) df.final(20) (C) df.end(20) (D) df.last(20)

Question 20

What is the correct syntax to return the entire DataFrame?

(A) df.dump() (B) df.full() (C) df.to_string() (D) df.print_full()

Question 21

A JavaScript library that is used for producing dynamic and interactive data visualizations on a web browser is known as _____.

(A) Brain.js (B) D3.js (C) Plotly.js (D) Chart.js

Question 22

Which is <u>not</u> a JavaScript library that can be used with browsers to create machine learning graphs and charts.

(A) Brain.js (B) D3.js (C) Plotly.js (D) Chart.js

Question 23

Which of these is <u>not</u> an example of a narrow Artificial Intelligence.

(A) Search Engines. (B) Email spam Filters. (C) Apple's Siri. (D) Automated Teller Machine.

Question 24

There are three phases in the life of a machine learning model. Which of the list below correctly shows these phases.

(A) Data Collection, Training and Testing.
(B) Data Collection, Training and Developing.
(C) Data Collection, Training and Inference.
(D) Data Collection, Training and Programming.

Question 25

There are cases where both inputs of a perceptron is zero. The output of such would be an incorrect output. To avoid this situation perceptrons are given an extra input with a value of 1. This is called a

_____

(A) neuron. (B) outlier. (C) bias. (D) weight.

Question 26

Which of the suggestions below is an example of how a perceptron can be tuned?

(A) Increase the number of training data.
(B) Decrease the number of training iterations.
(C) Increase the weights on each input.
(D) Increase the number of inputs.

Question 27

In machine learning terminology, the thing that we want to predict is known as _____

(A) Models. (B) Labels. (C) Features. (D) Relationships.

Question 28

A popular JavaScript library for machine learning models in the browser is known as _____

(A) Brain.js (B) D3.js (C) WebGL.js (D) TensorFlow.js

Question 29

Collecting data for every member of a group is known as _____

(A) Census. (B) Population. (C) Sample. (D) Model.

Question 30

In statistics, the average of the squared differences from the mean value is the _____

(A) Distribution. (B) Deviation. (C) Kurtosis. (D) Variance.

PART B: SHORT ANSWERS [70 MARKS]

Question 31 [3 + 3 + 4 = 10 Marks]

(a) Write python code to import "***data.csv***" file into a pandas DataFrame and print the entire DataFrame.

(b) The code in Question (a) imports data in the file ***data.csv*** into a DataFrame. Explain to a non-technical person what a DataFrame is.

(c) Use python code to create an output like the one shown below. Use a DataFrame object.

	calories	duration
0	420	50
1	380	40
2	390	45

Question 32 [3 + 3 + 4 = 10 Marks]

(a) Explain what Deep Learning is.

(b) What is Data Mining?

(c) Briefly discuss the difference between supervised learning and unsupervised learning approaches.

Question 33 [3 + 3 + 2 + 2 = 10 Marks]

(a) Explain what regression is.

(b) Explain what a polynomial regression is.

(c) Explain what the correlation coefficient is.

(d) Define a cluster.

Question 34 [10 Marks]

Write a full python program to depict a perceptron. The perceptron will use the details provided below to make a decision whether Jill can use the umbrella or not.

Criteria	**Input**	**Weights**
Heavy Rain	X1 = 0 or 1	0.7
Very Windy	X2 = 0 or 1	0.3
Sunny	X3 = 0 or 1	0.4

The threshold is 1.0

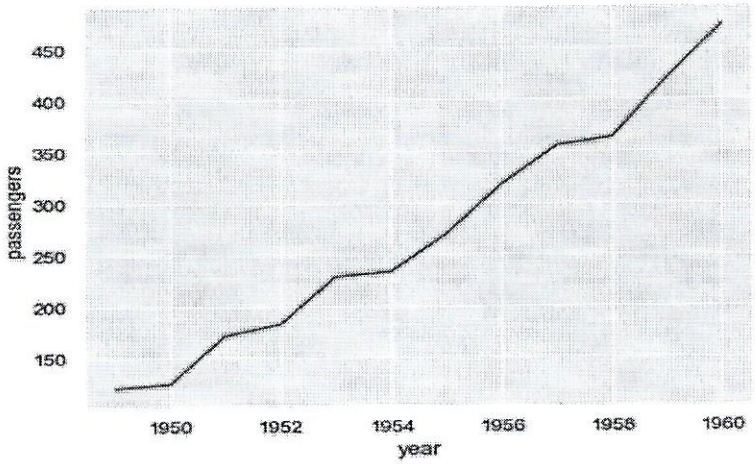
Let's assume both X1 and X2 are 1 respectively while X3 is 0. So we are saying it's a rainy day and she will have to use the umbrella.

Question 35 [10 Marks]

The flights dataset has 10 years of monthly airline passenger data. Using the information given below write the full code to produce a similar graph like the one shown below right. The graph shows data for the month of May over the 10 years.

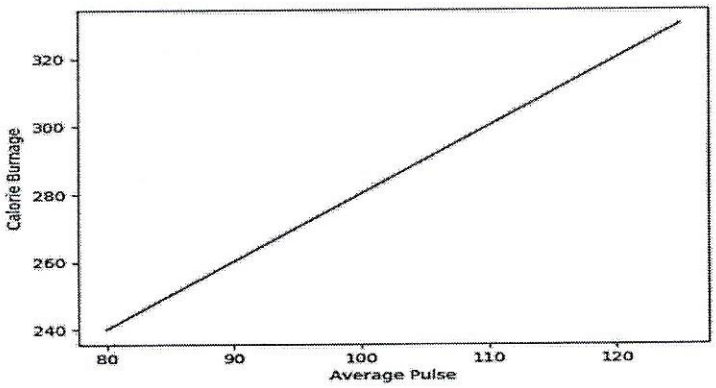
```
flights = sns.load_dataset("flights")
flights.head()
```

	year	month	passengers
0	1949	Jan	112
1	1949	Feb	118
2	1949	Mar	132
3	1949	Apr	129
4	1949	May	121



Question 36 [10 Marks]

Write a python program using pyplot and numpy to create a graph similar to the one shown in the figure below. The x and y values are provided below the graph.



X values	80	85	90	95	100	105	110	115	120	125
Y values	240	250	260	270	280	290	300	310	320	330

Question 37 [5 + 2 + 2 + 1 = 10 Marks]

The following questions require python codes.

(a) Write code to create and print a dictionary like the one shown below.

```
{'name':'John', 'gender':'male', 'year':1999}
```

(b) Write code to create and print a fruit list like the one shown below.

```
['apple', 'banana', 'cherry']
```

(c) Write code to print the second item in the fruit list given in Question (b).

(d) Write code to change the value from "apple" to "watermelon", in the fruits list.

END OF EXAMINATION.