PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE

SEMESTER 1 EXAMINATION – 2021

CS407 ARTIFICIAL INTELLIGENCE

FOURTH YEAR BACHELOR OF SCIENCE IN COMPUTER SCIENCE

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 begin writing during this time.
3. There are six (6) questions. **Attempt all the questions.**
4. All the answers must be written in the answer booklet. No other written materials will be accepted.
5. Do **not** use pencil or red pen to write your answers.
6. **MOBILE PHONES MUST BE SWITCHED OFF** for the entire duration of the examination. Students failing to do so will be penalised.
7. Scientific calculators are permitted and you are to show all calculations on the answer booklet.

MARKING SCHEME

Marks are indicated at the beginning of each question. The total is **80 marks.**

Question 1 [6 Marks]

Write a conditional block of code that takes a given temperature and compares it with the given conditions giving one of the four outputs if the condition is met. Only one condition should be met.

Temperature is less than 0 Celsius	"It's freezing outside"
Temperature is greater than 0 but less than 15 Celsius.	"You'll need a jacket."
Temperature is greater than 15 but less that 25 Celsius.	"It's sweater weather."
Temperature is greater than 25 but less than 40 Celsius.	"Time to turn on the air conditioning."

Question 2 [2 Marks each = 20 Marks]

From the following Python codes which are entered into Anaconda Python interpreter, determine the output of the last expression in each piece of code given.

(a)
```
numbers = [10, 20, 30, 40]
numbers[1] = 5
print(numbers)
```

(b)
```
t1 = ['u', 'v', 'w']
t2 = ['x', 'y', 'z']
t1.extend(t2)
print(t1)
```

(c)
```
t = ('a', 'b', 'c', 'd', 'e')
print(t[1:3])
```

(d)
```
t = ('a', 'b', 'c', 'd', 'e')
t[0] = 'A'
print(t)
```

(e)
```
t = ('a', 'b', 'c', 'd', 'e')
t = ('A',) + t[1:]
print(t)
```

(f)
```
dict = {'day1': 'Monday','day2': 'Tuesday', 'day3':'Wednesday'}
'day1' in dict
```

(g)
```
d = {'a':0, 'b':1, 'c':2}
t = d.items()
print(t)
```

(h)
```
dict2 = {'day1': 'Monday','day2': 'Tuesday', 'day3':'Wednesday'}
dict2.update([('day4', 'Thursday'),('day5', 'Friday'),('day6', 'Saturday')])
dict2
```

(i)
```
from collections import Counter
hist = Counter('Mary had a little lamb, little lamb, little lamb')
print(hist)
```

(j)
```
addr = 'humanresource@elamotors.com.pg'
uname, domain = addr.split('@')
print('uname =', uname)
print('domain =', domain)
```

Question 3 [3 + 6 + (2 + 2 + 2 + 2) = 17 Marks]

(a) Explain what a function's docstring is.

(b) Write a *word_match* function that should return *True* or *False.* Depending on if the *word* can be created from the string of *letters*. The *word* does not have to use all of the *letters*. Note: Each letter in *letters* can only be used once.

For example: word_match('top', 'potatoe'), returns True

word_match('ball', 'abcledg'), returns False

(c) Using Figure 1, answer the questions that follow.

	Members for group ML CMS Staff	Unnamed: 1	Unnamed: 2	Unnamed: 3	Unnamed: 4	Unnamed: 5	Unnamed: 6	Unnamed: 7	Unnamed: 8	Unnamed: 9	Unnamed: 10
0	Email address	Nickname	Group status	Email status	Email preference	Posting permissions	Join year	Join month	Join day	Join hour	Join minute
1	19800116mado@pgs.pnguot.ac.pg	NaN	member	bouncing	no email	not allowed	2019	2	24	21	18
2	abel.silas@pnguot.ac.pg	NaN	member	NaN	email	allowed	2017	10	29	22	36
3	abuzo.sankwi@pnguot.ac.pg	abuzo.sankwi	member	NaN	email	allowed	2016	2	4	15	34

Figure 1 - CMS Staff Mailing List

(i)   Write code to read from file *cmsstaff.csv* and display the output as shown.

(ii)   Using the DataFrame above write code to display the last 5 rows of the DataFrame.

(iii)   Write code to rename the column label "Members for group ML CMS Staff" to "Email Address"

(iv)   Write code to remove the first row of the DataFrame.

Question 4 [2 + 5 + 5 = 12 Marks]

Using Figure 2, answer the questions that follow. Only five rows are shown out of a large dataset.

	year	month	day	gender	births
0	1969	1	1	F	4046
1	1969	1	1	M	4440
2	1969	1	2	F	4454
3	1969	1	2	M	4548
4	1969	1	3	F	4548

Figure 2 – births.csv

(a) What is a pivot table?

(b) Write code to produce the table shown below using data from births.csv file.

gender	F	M
decade		
1960	1753634	1846572
1970	16263075	17121550
1980	18310351	19243452
1990	19479454	20420553
2000	18229309	19106428

(c) From above, write code to produce the line graph shown. For styles use *seaborn*.
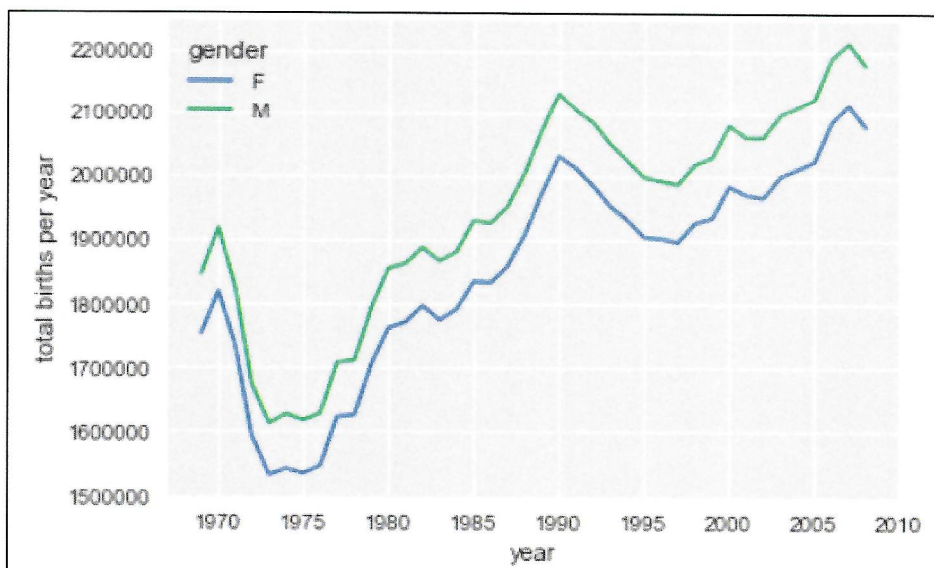
Question 5 [3 + 3 = 6 Marks]

Refer to the DataFrames *df1* and *df2* as shown by the code below which have been entered into Anaconda Python interpreter.

```
df1 = pd.DataFrame({'employee': ['Bob', 'Jake', 'Lisa', 'Sue'],
                    'group': ['Accounting', 'Engineering', 'Engineering','HR']})
df2 = pd.DataFrame({'employee': ['Lisa', 'Bob', 'Jake', 'Sue'],
                    'hire_date': [2004, 2008, 2012, 2014]})
```

Evaluate each of the following code expressions provided and write the expected values. If an expression is illegal and will result in an error write ERROR as the expected value.

(a)
```
display('df1', 'df2')
```

(b)
```
df3 = pd.merge(df1, df2)
df3
```

Question 6 [10 + 6 + 3 = 19 Marks]

(a) Briefly explain each of the five (5) qualities of great visualization as discussed in the book "The Truthful Art" by Alberto Cairo.
(b) Explain and give examples of the three mind bugs discussed in the book "The Truthful Art" by Alberto Cairo.
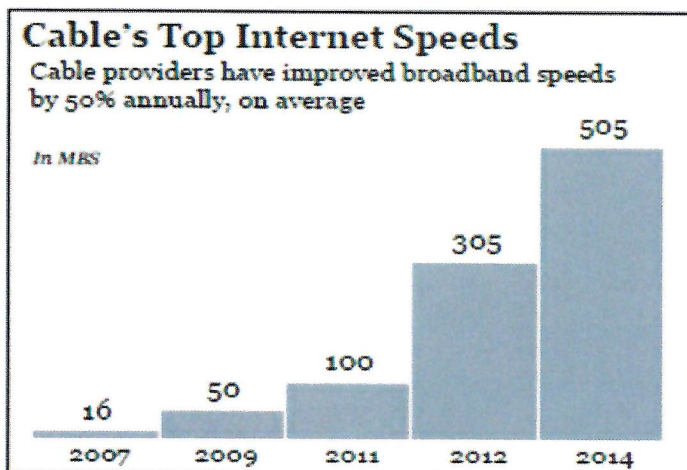(c) Using Figure 3, Explain why the graph shown is misleading audience.

Figure 3 - Cables top speed.

END OF EXAMINATION