YILDIZ TECHNICAL UNIVERSITY
FACULTY OF MECHANICAL ENGINEERING
DEP OF INDUSTRIAL ENGINEERING
2021/2022 FALL SEMESTER
END2971 – Advanced Computer Programming
EXAM: FINAL EXAM 1

MUDEK Criteria								Total
Question(s)	1	2	3	4	5	6	7	
Grade								

Name-Surname :
Student ID :
Signature :
Res. Assist :

Duration: 60 minutes
Date: 18.01.2022
Exam Place

Q1. (20p) The grades of a course is calculated by a midtem and a final. The midterm has a weight of 40% and the final has a weight of 60%. If the student did not take midterm since she is sick, then she has to take the make up exam. The midterm grades are recorded in the dictionary called MidDict, the makeup grades are recorded in MakeupDict dictionary and the final grades are recorded in FinalDict dictionary. If the student do not take any of the exams then her grades are recorded as zero in the MakeUpDict and zero in the FinalDict. Write a code that calculates the average grade of a student.

Q2. (18p)

Let's define a and b as follows:

```
a = np.array( [1,3,5,7] )
b = np.array([ [1,2], [3, 4], [5, 6] ])
```

What does the following commands print?

```
i) a[2]
```

```
ii) b[2]
```

```
iii) b[1,1]
```

```
iv) a>4
```

```
v) a[a>4]
```

```
vi) b[:,1]
```

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room

Good Luck…

Q3.(8x3 + 3x6 = 42p) Consider the following dataframe that we used throughout the lecture. The name of the dataframe is df. Please write the outputs of each command given in the following.

	brand	model	displ	cyl	cty
1	audi	a4	1.8	4	18
14	audi	s4	3.0	6	17
78	ford	explorer	1.8	4	14
84	ford	mondeo	3.0	5	14
91	ford	focus	1.8	5	18
100	honda	civic	3.0	4	28
109	hyundai	elentra	3.0	6	18
123	jeep	cherokee	3.0	6	17
134	fiat	albea	1.8	8	11
222	VW	golf	1.8	6	35
228	VW	passat	1.8	8	21

1. `df[ df['cyl'] > 7 ]`

2. `df[ df['cyl'] > 7 ]['cty'].mean()`

3. `df.loc[1]['brand']`

4. `df.loc[2]['brand']`

5. `df.iloc[2]['brand']`

6. `df['cyl'].unique()`

7. `df[1]`

8. `df['displ']`

9. df[['brand','cty']].groupby('brand').transform(np.nanmean)

10. df.groupby('brand').filter(lambda x:np.nanmean(x['cty'])>20)

11. df.pivot_table(values='cty', index='displ', columns='cyl', aggfunc=[np.max])

Q4.*(20p) Consider the following optimization problem that is coded in CBC.*

```
from pulp import*
Factory = ["A", "B"]
Mall = ["M1", "M2", "M3", "M4"]

Prod = {"A": 1000,"B": 2000}
Sales = {"M1": 1500,"M2": 600,"M3": 700,"M4": 200}
Cost = {"A": {"M1":2, "M2":4, "M3":5, "M4":2},
        "B": {"M1":3, "M2":1, "M3":3, "M4":2}}

prob = LpProblem("Final Exam", LpMinimize)

X = LpVariable.dicts("x",(Factory, Mall), lowBound = 0,
upBound = None, cat = const.LpInteger)

prob += lpSum(Cost[f][s]*X[a][b] for f in Factory for s in
Mall)

for w in Factory:
    prob += lpSum(X[f][s] for s in Mall) <= Prod[f]

for b in Mall:
    prob += lpSum(X[f][s] for f in Factory) >= Sales[s]
```

We are trying to model the sales distribution channel of a supply chain. There are two factories (A, B) and four Malls (M1,M2,M3,M4). On the left you can see the Python code of the optimization problem for CBC library. Please solve the following questions.

a. Write the mathematical model of the second for loop that is written in bold.

b. Assume factory B cannot serve second and third mall, i.e. there is no flow from factory B to M2 and M3. Write the mathematical equation for this constraint

a.
b.