Code

November 16, 2019

[13]:
```
import pandas as pd
import numpy as np
import itertools
import matplotlib.pyplot as plt
import networkx as nx
import warnings


data = pd.read_csv("course1.txt", delimiter = ',')
df = pd.DataFrame(data)
courses = df['Course'].unique()
n = len(courses)
print(f"Courses:{courses} Distinct:{n}")
sem = df['Sem'].unique()
s = len(sem)
print(f"\nSem:{sem} Distinct:{s}")
c=[[[]*6]*s]*n
#here 6 is the maximum no. of subjects in each sem
students=[]

subjects={}
i=0
courses_count=[]*n

for s1,s2,s3,s4,s5,s6,c in␣
 ↪zip(df['Sub1'],df['Sub2'],df['Sub3'],df['Sub4'],df['Sub5'],df['Sub6']
                                ,df['Course']):
    if s1 not in subjects and s1 == s1:
        subjects.update({s1:i})
        i=i+1
    elif s2 not in subjects and s2 == s2:
        subjects.update({s2:i})
        i=i+1
    elif s3 not in subjects and s3 == s3:
        subjects.update({s3:i})
        i=i+1
    elif s4 not in subjects and s4 == s4:
```

```
        subjects.update({s4:i})
        i=i+1
    elif s5 not in subjects and s5 == s5:
        subjects.update({s5:i})
        i=i+1
    elif s6 not in subjects and s6 == s6:
        subjects.update({s6:i})
        i=i+1
print("\nTotal Number of subject is:",len(subjects))


matrix = [[0 for i in range(len(subjects))] for j in range(s*n)]
#initalizing matrix
for s1,s2,s3,s4,s5,s6,sem,course in␣
 ↪zip(df['Sub1'],df['Sub2'],df['Sub3'],df['Sub4'],df['Sub5'],
                                        df['Sub6'],df['Sem'],df['Course']):
    if course == 'MTech':
        sem = sem +3
    if s1 == s1:
        matrix[sem-1][subjects[s1]]=1
    if s2 == s2:
        matrix[sem-1][subjects[s2]]=1
    if s3 == s3:
        matrix[sem-1][subjects[s3]]=1
    if s4 == s4:
        matrix[sem-1][subjects[s4]]=1
    if s5 == s5:
        matrix[sem-1][subjects[s5]]=1
    if s6 == s6:
        matrix[sem-1][subjects[s6]]=1



Student_mat=pd.DataFrame(matrix, columns=subjects.keys())
print("\n\nList of Subject semester wise:")
Student_mat
```

```
Courses:['MCA' 'MTech'] Distinct:2

Sem:[1 2 3] Distinct:3

Total Number of subject is: 18


List of Subject semester wise:
```

[13]:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
2	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
4	1	1	0	0	1	1	0	0	0	0	0	0	1	0	1	1	0	0
5	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1

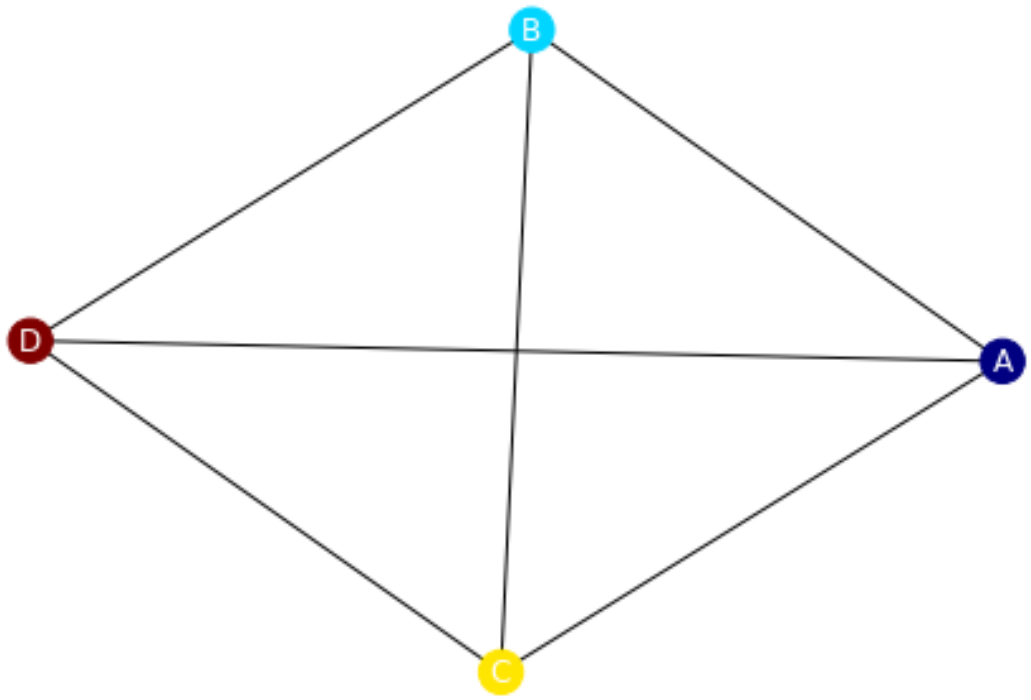
[14]:
```
reverse = dict(zip(subjects.values(),subjects.keys()))
```

1 Course 1

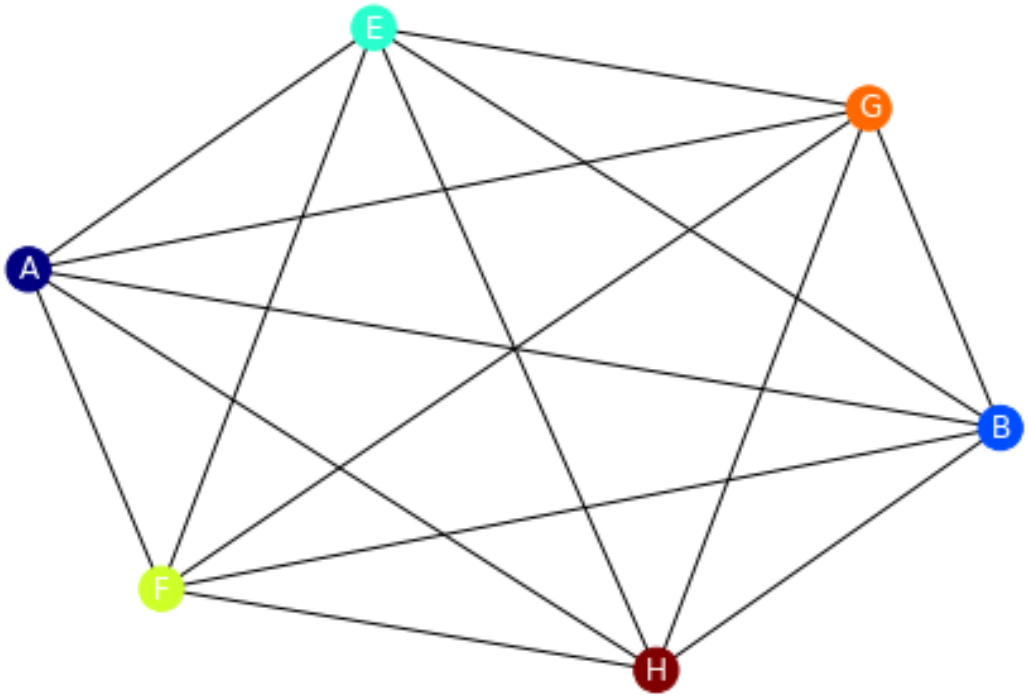
[18]:
```
color_subjects={}
datesheet=[[]]
CompleteGraph = nx.Graph()
k=1
x=1
#1st chromatic no.
for i in range(0,s):
    sub=[]
    G = nx.Graph()
    for j in range(0,len(subjects)):
        if matrix[i][j]==1:
            sub.append(reverse[j]) #sem wise subject list
    datesheet.append(sub)

 #sub contains sub in each sem
    #removing colors that have been used
    chromatic=[0,1,2,3,4,5,6]
    for y in range(0,i):
        for z in range(0,len(subjects)):
            if matrix[y][z] == 1 and reverse[z] in sub and␣
↪color_subjects[reverse[z]] in chromatic:
                chromatic.remove(color_subjects[reverse[z]])
    index=0
    for subject in range(0,len(sub)):
        if sub[subject] not in color_subjects.keys():
            color_subjects.update({sub[subject]:chromatic[index]})
            index=index+1
    print("Complete Graph for Subject of Sem ",(x)%4,":")
    print(sub)
    x+=1
    G.add_nodes_from(sub)
    G.add_edges_from(itertools.combinations(sub, 2))
    values = [color_subjects.get(node,0.25) for node in G.nodes()]
    CompleteGraph.add_nodes_from(sub)
```

```
    CompleteGraph.add_edges_from(itertools.combinations(sub, 2), weight =8)
    nx.draw(G, cmap=plt.get_cmap('jet'), node_color=values, with_labels=True,␣
↪font_color='white')
    plt.show()
```

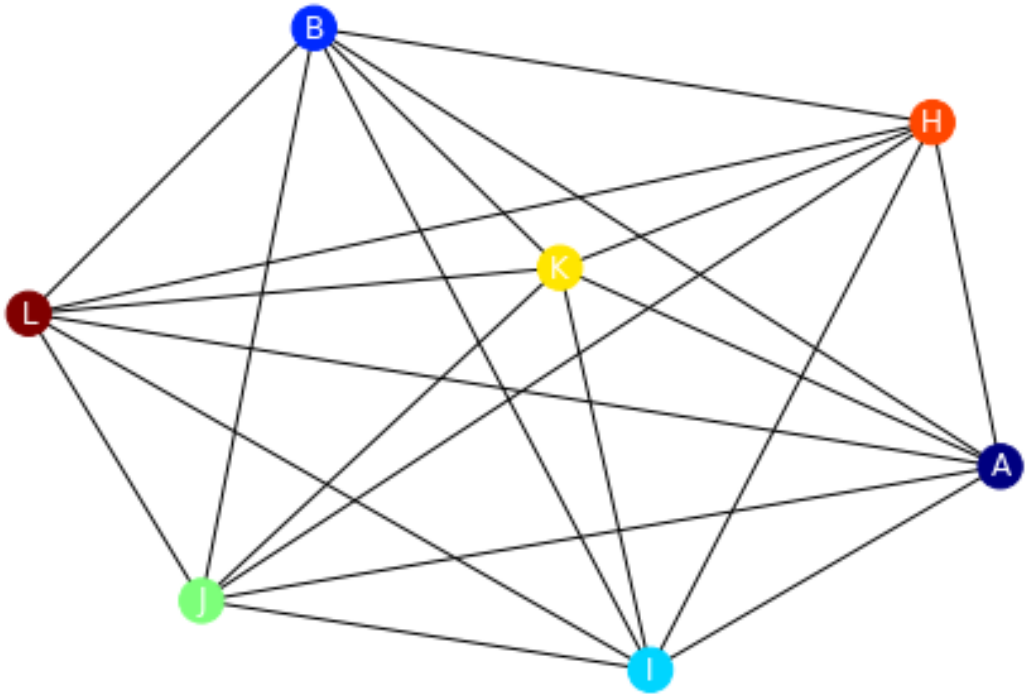
```
Complete Graph for Subject of Sem  1 :
['A', 'B', 'C', 'D']
```




```
Complete Graph for Subject of Sem  2 :
['A', 'B', 'E', 'F', 'G', 'H']
```




```
Complete Graph for Subject of Sem  3 :
['A', 'B', 'H', 'I', 'J', 'K', 'L']
```

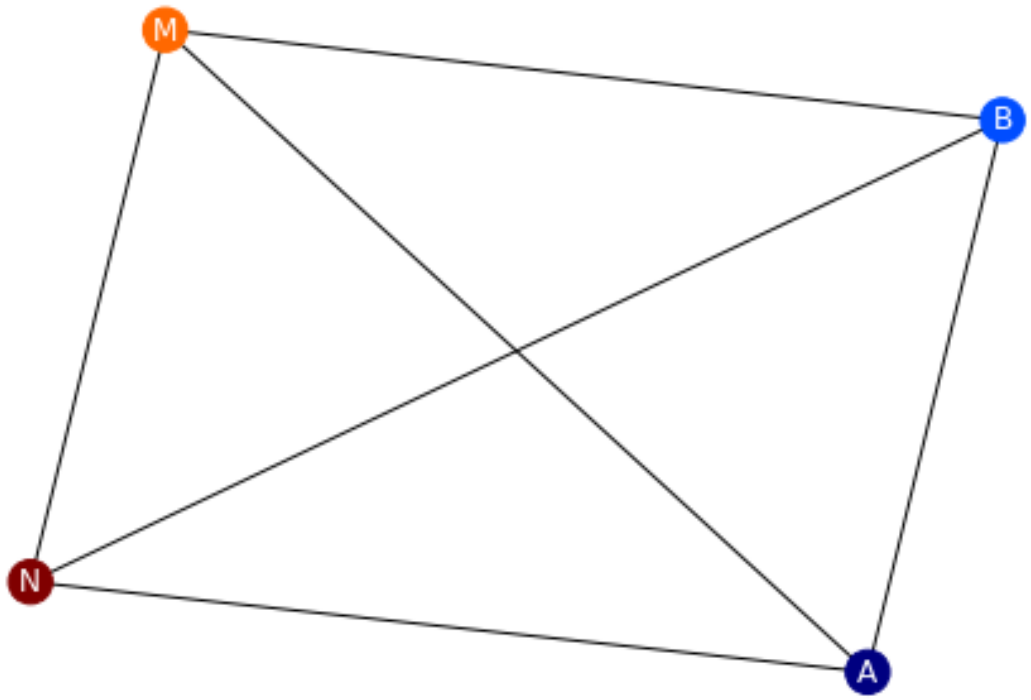


2 Course 2

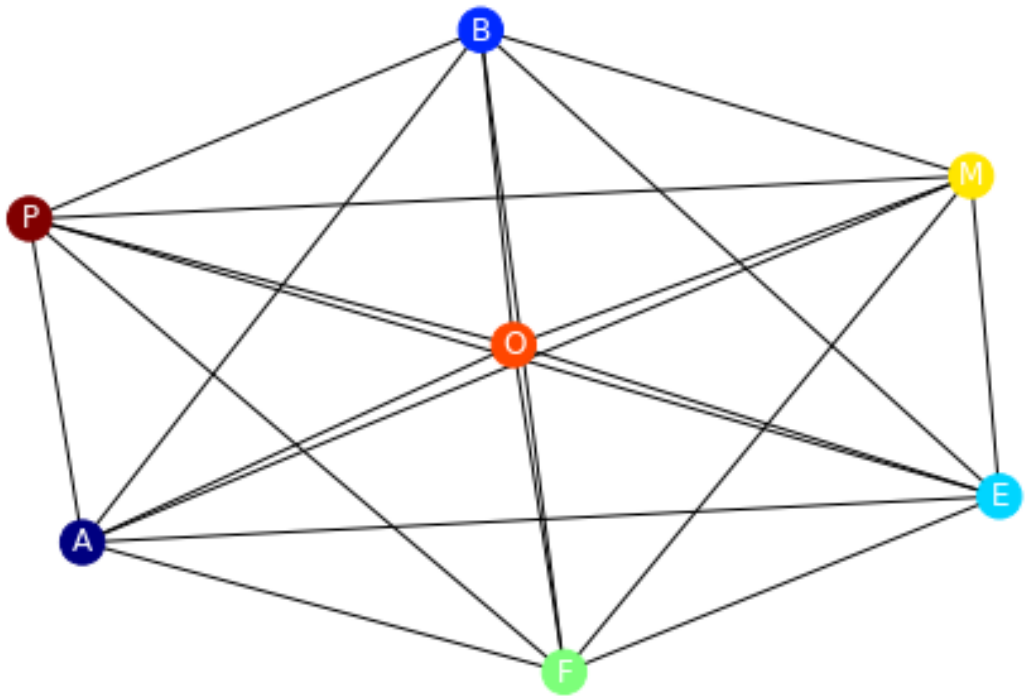
[19]:
```
x=1
for i in range(s,n*s):
    sub=[]
    G = nx.Graph()
    for j in range(0,len(subjects)):
        if matrix[i][j]==1:
            sub.append(reverse[j]) #sem wise subject list
    datesheet.append(sub)
 #sub contains sub in each sem
    #removing colors that have been used
    chromatic=[0,1,2,3,4,5,6]

    for y in range(0,i):
        for z in range(0,len(subjects)):
            if matrix[y][z] == 1 and reverse[z] in sub and␣
↪color_subjects[reverse[z]] in chromatic:
                chromatic.remove(color_subjects[reverse[z]])

    for y in range(i+1,s*n):
        for z in range(0,len(subjects)):
```

```
            if matrix[y][z] == 1 and reverse[z] in color_subjects.keys() and␣
↪color_subjects[reverse[z]] in chromatic:
                chromatic.remove(color_subjects[reverse[z]])

    index=0
    for subject in range(0,len(sub)):
        if sub[subject] not in color_subjects.keys():
            color_subjects.update({sub[subject]:chromatic[index]})
            index=index+1
    print("Complete Graph for Subject of Sem ",(x)%4,":")
    print(sub)
    x+=1
    G.add_nodes_from(sub)
    G.add_edges_from(itertools.combinations(sub, 2))
    CompleteGraph.add_nodes_from(sub)
    CompleteGraph.add_edges_from(itertools.combinations(sub, 2),weight=8)
    values = [color_subjects.get(node,0.25) for node in G.nodes()]
    nx.draw(G, cmap=plt.get_cmap('jet'), node_color=values, with_labels=True,␣
↪font_color='white')
    plt.show()
```

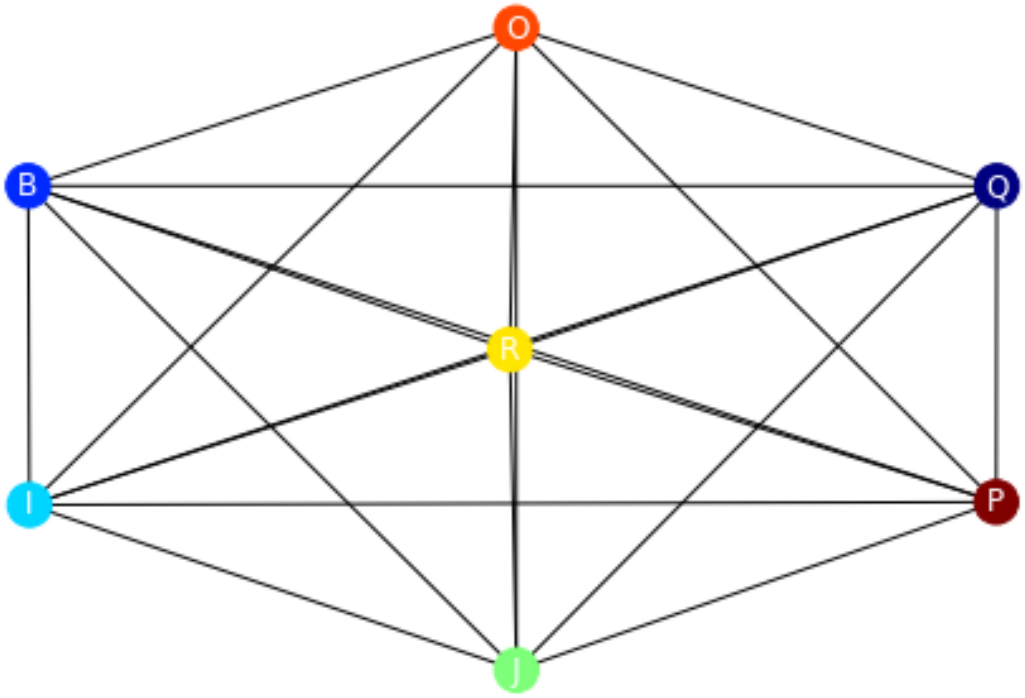
```
Complete Graph for Subject of Sem  1 :
['A', 'B', 'M', 'N']
```



Complete Graph for Subject of Sem 2 :
['A', 'B', 'E', 'F', 'M', 'O', 'P']

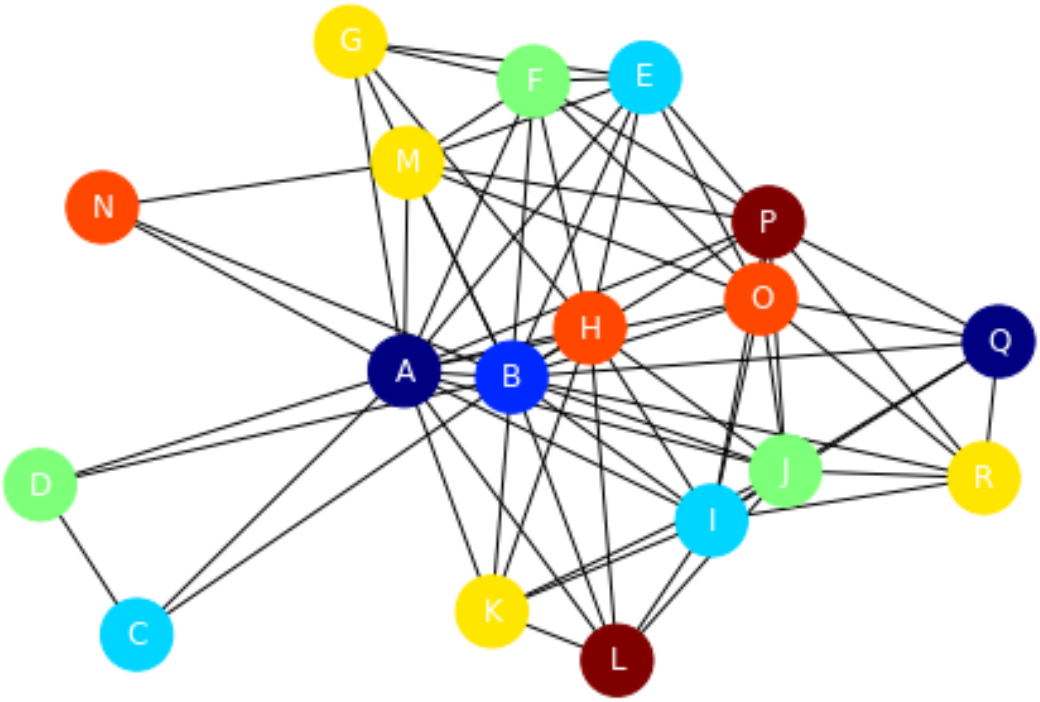


Complete Graph for Subject of Sem 3 :
['B', 'I', 'J', 'O', 'P', 'Q', 'R']



[21]:
```
print("Graph for All Subjects")
values = [color_subjects.get(node,0.25) for node in CompleteGraph.nodes()]
nx.draw(CompleteGraph, node_size=800, cmap=plt.get_cmap('jet'),␣
 ↪node_color=values, with_labels=True, font_color='white')
nx.draw
plt.show()
```

```
Graph for All Subjects
```



[11]:
```
print("Colors alloted to Each Subject")
for i,j in zip(color_subjects.keys(),color_subjects.values()):
    print(i,"-",j)
```

```
Colors alloted to Each Subject
A - 0
B - 1
C - 2
D - 3
E - 2
F - 3
G - 4
H - 5
I - 2
J - 3
K - 4
L - 6
M - 4
N - 5
O - 5
P - 6
Q - 0
R - 4
```

[12]:
```
data=np.chararray((6,9),unicode=True)
for i in range(0,n*s):
    for j in range(0,len(subjects)):
        if matrix[i][j] is 1:
            data[i][2+color_subjects[reverse[j]]]=str(reverse[j])
final = pd.DataFrame(data, columns = ['Course','Sem',␣
↪'Slot1','Slot2','Slot3','Slot4','Slot5','Slot6','Slot7'])
for i in range(0,n*s):
    if i < s:
        final.at[i,'Course']=(df['Course'].unique()[0])
    else:
        final.at[i,'Course']=(df['Course'].unique()[1])
    final.at[i,'Sem']=(df['Sem'].unique()[(i)%s])

print("\nFinal Schedule For Each Semester:")
final
```

```
Final Schedule For Each Semester:
```

[12]:

	Course	Sem	Slot1	Slot2	Slot3	Slot4	Slot5	Slot6	Slot7
0	MCA	1	A	B	C	D			
1	MCA	2	A	B	E	F	G	H	
2	MCA	3	A	B	I	J	K	H	L
3	MTech	1	A	B			M	N	
4	MTech	2	A	B	E	F	M	O	P
5	MTech	3	Q	B	I	J	R	O	P