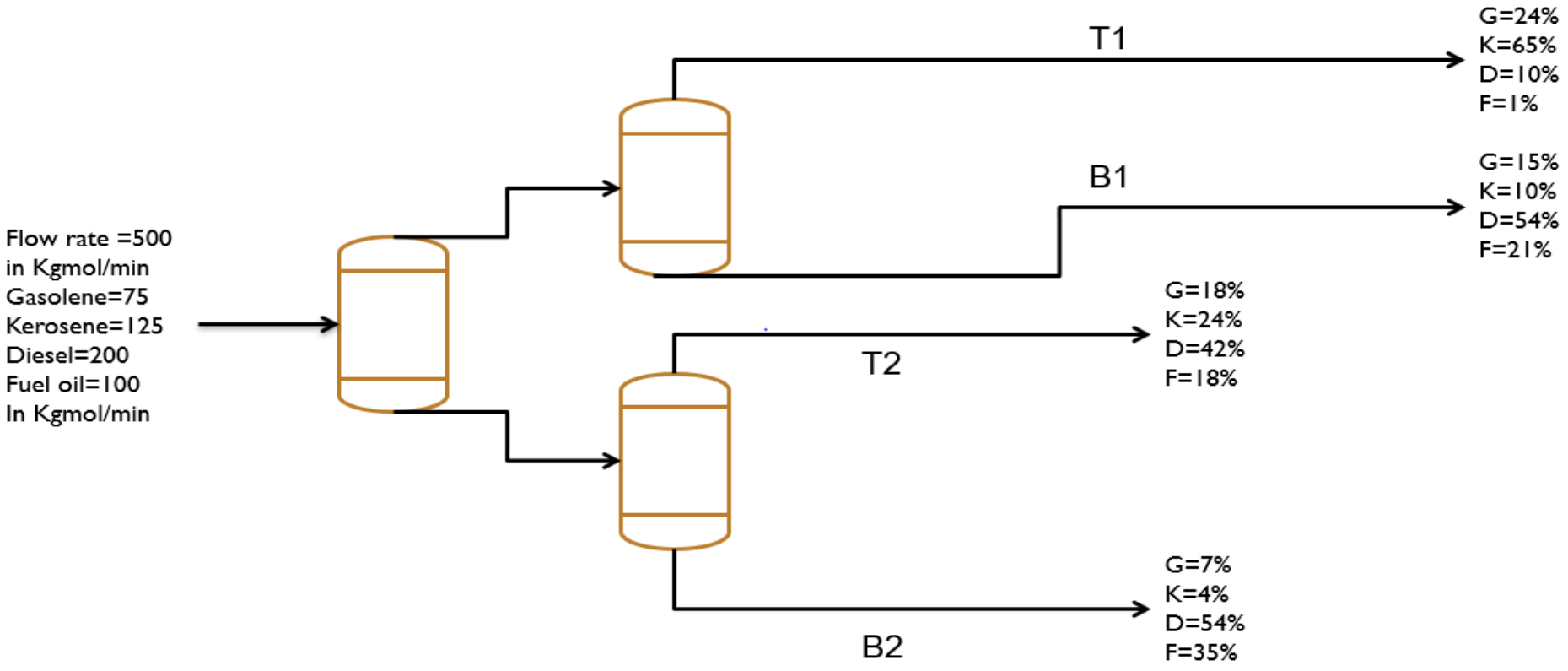
# Linear algebra – Part 2

GITAA
Transforming careers

# Mass balance

- Consider a series of distillation columns



# Mass balance

- The input flow rates of Gasoline, Kerosene, Diesel and Fuel Oil are given in Kgmol/min
- The output flowrates from the two distillation columns have been indicated in percentages by mass for each of the components
- The actual output flowrates are need to be determined

# Mass balance

Flow system can be represented by a set of equations considering mass flow rate in kgmol/min

$$0.24T1 + 0.15B1 + 0.18T2 + 0.07B2 = 75$$
$$0.65T1 + 0.10B1 + 0.24T2 + 0.04B2 = 125$$
$$0.10T1 + 0.54B1 + 0.42T2 + 0.54B2 = 200$$
$$0.01T1 + 0.21B1 + 0.18T2 + 0.35B2 = 100$$

# Mass balance

$$\begin{pmatrix} 0.24 & 0.15 & 0.18 & 0.07 \\ 0.65 & 0.10 & 0.24 & 0.04 \\ 0.10 & 0.54 & 0.42 & 0.54 \\ 0.01 & 0.21 & 0.18 & 0.35 \end{pmatrix} \begin{pmatrix} T1 \\ B1 \\ T2 \\ B2 \end{pmatrix} = \begin{pmatrix} 75 \\ 125 \\ 200 \\ 100 \end{pmatrix}$$

A x b

- Create the matrix

```
A=np.matrix("0.24,0.15,0.18,0.07;0.65,0.10,0.24,0.04;\
             0.10,0.54,0.42,0.54;0.01,0.21,0.18,0.35")

b=np.matrix("75,125,200,100").T
```

# Mass balance

- Print matrix ***A*** and ***b***

```
In [12]: print(A)
[[ 0.24  0.15  0.18  0.07]
 [ 0.65  0.1   0.24  0.04]
 [ 0.1   0.54  0.42  0.54]
 [ 0.01  0.21  0.18  0.35]]
```

```
In [14]: print(b)
[[ 75]
 [125]
 [200]
 [100]]
```

```
x=np.linalg.solve(A,b)
```

```
In [16]: print(x)
[[ 138.70453942]
 [ 112.15821609]
 [  68.57800195]
 [ 179.18768251]]
```


operation == "MIRROR_X":
irror_mod.use_x = True
irror_mod.use_y = False
irror_mod.use_z = False
operation == "MIRROR_Y":
irror_mod.use_x = False
irror_mod.use_y = True
irror_mod.use_z = False
operation == "MIRROR_Z":
irror_mod.use_x = False
irror_mod.use_y = False
irror_mod.use_z = True
selection at the end -add
ob.select= 1
er_ob.select=1
ntext.scene.objects.acti
("Selected" + str(modifier
irror_ob.select = 0
bpy.context.selected_ob
ata.objects[one.name].se
int("please select exact

# THANK YOU