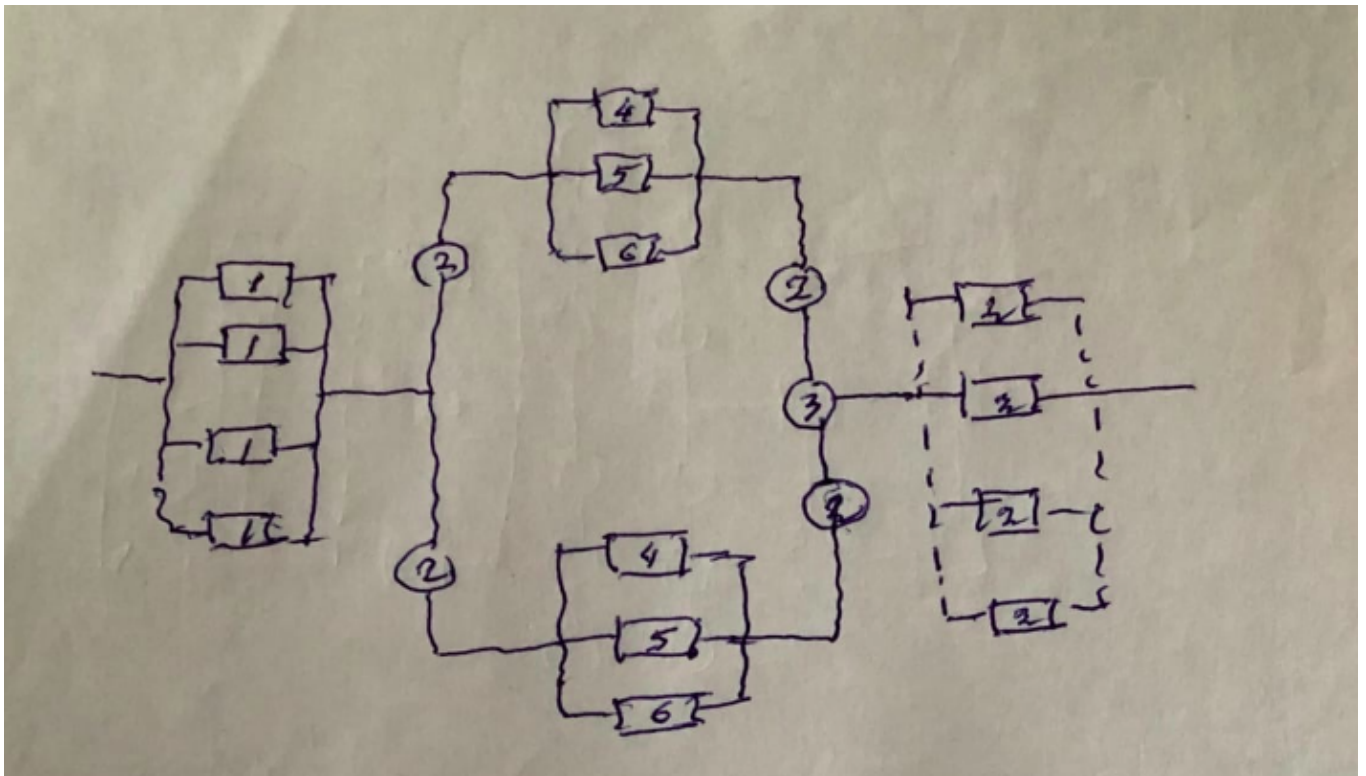*Homework 1*

We have a chain of system's units where each of them has own failure rate (Lambda). System is howed on a pic. Lamdas are known.

Task: Calculate likelyhood of system's correct work where t = [10_000, 100_000, 100 000 - 10 000]

In [1]:

```
lambdas = [lam*(10**-4) for lam in [0.2, 0.1, 0.25, 0.3, 0.4, 0.5]]
lambdas
```

Out[1]:

```
[2e-05, 1e-05, 2.5e-05, 3e-05, 4e-05, 5e-05]
```

Lets calculate probabilities

In [2]:

```
from math import exp, factorial as F

# Time vars were changed !
time_1, time_2 = 10_000, 100_000

prob_time_1 = [round(exp(-lam*time_1), 3) for lam in lambdas]
prob_time_2 = [round(exp(-lam*time_2), 3) for lam in lambdas]
prob_time_1, prob_time_2
```

Out[2]:

```
([0.819, 0.905, 0.779, 0.741, 0.67, 0.607],
 [0.135, 0.368, 0.082, 0.05, 0.018, 0.007])
```

Split scheme on a few parts and calculate them

In [24]:

```
PartI_1 = 1 - (1 - prob_time_1[0])**4
PartI_2 = 1 - (1 - prob_time_2[0])**4

PartII_1 = 1 - (1 - prob_time_1[3])*(1 - prob_time_1[4])*(1 - prob_time_1[5])
PartII_2 = 1 - (1 - prob_time_2[3])*(1 - prob_time_2[4])*(1 - prob_time_2[5])

PartIII_1 = 1 - (1/F(4))*(1 - prob_time_1[1])**4
PartIII_2 = 1 - (1/F(4))*(1 - prob_time_1[1])**4

print('Part0 is : \t', round(PartI_1, 5), 'and', round(PartI_2, 5))
print('PartII is : \t', round(PartII_1, 5), 'and', round(PartII_2, 5))
print('PartIII is :\t', round(PartIII_1, 5), 'and', round(PartIII_2, 5))
```

```
Part0 is :       0.99893 and 0.44016
PartII is :      0.96641 and 0.07363
PartIII is :     1.0 and 1.0
```

In [4]:

```
Chain_1 = PartI_1*PartIII_1*(1 - (1 - PartII_1))
Chain_2 = PartI_2*PartIII_2*(1 - (1 - PartII_2))
```

In [5]:

```
print('Answer is: \n')
print('Chain({}) = '.format(time_1), round(Chain_1, 5))
print('Chain({}) = '.format(time_2), round(Chain_2, 5))
print('Chain(t1-t2) = Chain_2/Chain_1 =', round(Chain_2/Chain_1, 5))
```

```
Answer is:

Chain(10000) =  0.96537
Chain(100000) =  0.03241
Chain(t1-t2) = Chain_2/Chain_1 = 0.03357
```