**Homework 5**

**16340305 郑先淇**

**题目**

*Consider the process in figure 4.46.*



*(a) Determine the following performance indicators:*

*• Occupation rate (utilization) for each resource,*

*• Average WIP (work in progress),*

*• Average flow time (throughput time), and*

*• Average waiting time for each task.*

*Task 2 is a check task. The management thinks about a selective execution*

*of this task where only 25% of the cases are checked. The average*

*service time of this new task is 6 minutes.*

*(b) Determine the performance indicators again:*

*• Occupation rate (utilization) for each resource,*

*• Average WIP (work in progress),*

*• Average flow time (throughput time), and*

*• Average waiting time for each task.*

**解答**

**(a)**

由上图可看出，有两个任务，task\_1和task\_2。

对于task\_1,有λ = 20(以小时为单位)，μ = 60/2 = 30（以小时为单位），则有

Utilization a = λ/μ = 0.67

Average WIP L = a/(1-a) = 2

Average waiting time = L/μ = 2/30 = 1/15（4分钟）

Average flow time = waiting time + processing time

= W + 1/μ = 1/15 + 1/30 = 1/10（6分钟）

对于task\_2,由于通过task\_1的任务每小时最多20个，所以task\_2的λ也是20，μ = 60/2.5 = 24(以小时为单位)，则有

Utilization a = λ/μ = 0.83

Average WIP L = a/(1-a) = 5

Average waiting time = L/μ = 5/24（12.5分钟）

Average flow time = waiting time + processing time

= W + 1/μ = 5/24 + 1/24 = 1/4（15分钟）

**(b)**

对于task\_1来说其条件没有变化，所以仍有

Utilization a = λ/μ = 0.67

Average WIP L = a/(1-a) = 2

Average waiting time = L/μ = 2/30 = 1/15（4分钟）

Average flow time = waiting time + processing time

= W + 1/μ = 1/15 + 1/30 = 1/10（6分钟）

对于task\_2,由于现在该任务变成可选任务，到达的任务中只有25%需要被检查，则有λ = 20\*25% = 5；因为处理时间变为6分钟，则有μ = 60/6 = 10(以小时为单位),则有

Utilization a = λ/μ = 0.5

Average WIP L = a/(1-a) = 1

Average waiting time = L/μ = 1/10（6分钟）

Average flow time = waiting time + processing time

= W + 1/μ = 1/10 + 1/10 = 1/5（12分钟）