

SIMATS ENGINEERING

THANDALAM

## ASSIGNMENT - 04

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| • SUBMISSION DATE   | : 28/07/2025                                    |
| • TOPIC             | : MULTI - SERVER QUEUE ANALYSIS                 |

# SIMATS ENGINEERING

## ASSIGNMENT - 04

CSA0735 : COMPUTER NETWORK FOR COMMUNICATION

REGISTER NUMBER	NAME	SCENARIO
192511172	SAMRAKSHINI.G	A MULTI-SERVER QUEUE HANDLES PAYMENT REQUESTS

PARAMETERS :  $\rightarrow$  5 SERVERS  $\rightarrow$   $\lambda = 100/s$   $\rightarrow$   $\mu = 30/s$

### QUESTIONS :

1. **WHAT IS THE TOTAL SERVICE RATE ?**

Given data :

- i) Arrival rate ( $\lambda$ ) = 100 requests / second
- ii) Service rate per second - ( $\mu$ )  
30 requests / second
- iii) Number of servers ( $C$ ) = 5 servers

$\rightarrow$  Total service rate in multimedia server queue is simply the product of all number of servers and the service rate per server.

**TOTAL SERVICE RATE :  $C \times \mu$**

$\therefore$  Total service rate =  $30 \times 5 = 150$  requests / second

This means the system, with its current 5 servers,



is collectively capable of processing 150 server's payment requests per second.

## 2) WHAT IS UTILIZATION ?

Utilization ( $P$ ) is the ratio of the incoming workload to the system's processing capacity. It helps in assessing whether the system is underloaded, optimally loaded or overloaded.

$$P = \frac{\lambda}{C \times \mu}$$

Here

$\lambda$	=	100		s
$C$	=	5		
$\mu$	=	30		s

• SUBSTITUTING THE VALUES:

$P =$	$\frac{100}{5 \times 30}$	$= \frac{100}{150} = 0.6667$
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This implies that the system is 66.67% utilized.

→ In queueing systems, this is a favorable state because it indicates that the system servers are not overwhelmed, and there is a manageable level of queuing.

→ Typically, systems are considered stable when  $P < 1$  and more efficient when  $P < 0.8$ , depending on service needs.

## 3) IF ONE SERVER IS ADDED, WHAT IS NEW UTILIZATION ?

→ NO. OF. SERVERS  $C = 6$

→ SERVICE RATE PER SERVER REMAINS THE SAME

$$\mu = 30/s$$

$$p_{\text{new}} = \frac{\lambda}{c \times \mu}$$

HERE  $c=6$

$$\lambda = 100/s$$

$$\mu = 30/s$$

$$p_{\text{new}} = \frac{100}{6 \times 30} = \frac{100}{180} \approx 0.5556$$

→ With the addition of 1 more server, the system's utilization drops to 55.56%.

→ Which is an improvement in terms of handling more load or reducing the probability of queuing delays. It means;

- → Shorter waiting time
- → Lower probability of customer queue buildup.
- → More space capacity.