

Assignment 8

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Download all python codes from

https://github.com/pranav-159/ai1103_Probability_and_Random_variables/blob/main/Assignment_8/codes/experimental_verification_Assignment8.py

1 PROBLEM

GATE 2021 (ME-SET1), Q.42 (ME section)

Consider a single machine workstation to which jobs arrive according to a Poisson distribution with a mean arrival rate of 12 jobs/hour. The process time of the workstation is exponentially distributed with a mean of 4 minutes. The expected number of jobs at the workstation at any given point of time is ... (round off to the nearest integer).

2 SOLUTION

For job arrival,

- It is distributed according to Poisson distribution.
- Its Rate parameter $\lambda=12$ jobs/hour

For Job completions,

- Job completion time is distributed exponentially with mean of 4 minutes
- Then we can assume that no. of job completions are distributed as Poisson distribution with rate parameter $\mu = 15$ jobs/hour

Let $\rho = \frac{\lambda}{\mu}$,

In the case where both job completions and

job arrivals are distributed by Poisson distribution, Expected no. of jobs at workstation is,

$$E(j) = \frac{\rho}{1 - \rho} \quad (2.0.1)$$

In our case $\rho = \frac{\lambda}{\mu} = \frac{12}{15} = \frac{4}{5}$.

Substituting it in the (2.0.1) we get,

$$E(j) = 4 \quad (2.0.2)$$

\therefore Expected no. of jobs at workstation is 4.

Parameter	Definition
λ	Poisson rate parameter for the arrival of jobs
μ	Poisson rate parameter for the completion of jobs
ρ	$\frac{\lambda}{\mu}$

TABLE 0: Parameters and their definitions used in the problem