ABSTRACT

CHARACTERISTICS OF A PRODUCTION SYSTEM CONSISTING OF \( m \) MACHINES AND \( s \) SETUP MEN

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A queueing problem of jobs in one type of production system which consists of \( m \) machines and \( s \) setup men are discussed. In this system, the each job requires to be automatically machined after completion of setup. It is assumed that the jobs arrive at the system with a Poisson process and that setup time and machining time are exponentially distributed. This paper obtains the following results.

1. When \( R \) is the minimal non-negative solution of the matrix-geometric form by Neuts, the eigenvalues of \( R \) can be calculated by the following equation:

\[
\left| A_0 + yA_1 + y^2A_2 \right| = 0
\]

Then, it is shown that excepting the eigenvalues of \( R \) the every root of the equation does not lie inside the unit disk.

2. Some numerical experiments concerning with the trade off on the men and machines utilization are carried out. From the results, increase of \( m/s \) is effective to increase both the men and machines utilization. Also two ways to increase \( m/s \) are proposed.

3. Some numerical data which are concerned with the average number of jobs in the system and the average time spent in the system (i.e. the average production lead-time) are offered for \( s=1, 2, \) and 3. From these data, when a net utilization of machines is given, there is an utilization of man to minimize the production lead-time.