Queuing system behaviour in thermo pack process

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Abstract: The Queuing model introduced here defines a batch arrival model with the extra assumption of stages of service. In addition, the system deploys a set up time stage for the pre-processing work to be carried out, which is essential for the stages of service. In addition, we introduce a new factor Reneging that occurs twice in this model during the setup time stage and also during the time of compulsory vacation. Customer’s arrival follows a Poisson distribution, while the service rendered follows a general distribution. Here, we carry out the concept of Compulsory vacation as a maintenance work duration, which helps to reduce the occurrence of service interruption. The model is well elucidated with thermo pack process from mechanical engineering. Thermo pack is the machine that is used as a boiler. Generally, we raise the temperature of oil in the thermo pack. The working principle of the thermo pack is similar to that of an ordinary boiler. It can raise the temperature of the oil from the initial temperature along with the temperature of oil which has been already used once. After the production of hot oil, it is allowed to flow around the mould to keep up the temperature inside the mould. In other cases, this oil can also be used for refining purposes. Nowadays, recent advancements in the thermo pack have led to the creation of new and advanced small size thermo pack for small-scale production. The procedure completed in this structure is considered through Queuing hypothesis. The above process comprises queuing parameters like set up time, stages of process, compulsory vacation process and the concept of types of Reneging. The Queuing issue emerges in the above auxiliary technique is understood by valuable variable strategy. The probability of creating capacity of the line size, duration of line, the number of clients in the framework, holding up time of the clients in the line just as in the framework, usage factor and the inert time of the server are inferred. Numerical delineation and a broadened graphical assessment are undertaken around the conclusion to help the model.

Keywords: Set up time, stages of service, reneging, thermo pack process, supplementary variable strategy.

1. Introduction
Lining investigation is a numerical model which speaks about the procedure of appearance of clients shaping a line if administration isn’t quickly accessible, administration process as well as the time taken to serve the clients. The Queuing model with worker get-away has been especially considered and enough applied in different zones. Here Vacation suggests the temporary inaccessibility of associations in the structure. Move away lines are a noteworthy zone in the composition of covering speculation. Different extensions in the basic coating models have been made and the thoughts like get-aways lining, related covering, retrial lining, fixing with nervousness. An excursion in a lining setting is a period when the...
worker isn't accessible for offering support. Appearances coming during the get-away can go into administration simply after the worker gets back from get-away. There are numerous circumstances that lead to a worker excursion, for example machine breakdowns, frameworks support and cyclic workers. Additionally the administration is likewise given in two phases, both are mandatory. Furthermore the idea of arrangement time and reneging are the recently included boundaries which are unavoidable in the truth of lining framework. Numerous analysts have conducted broad investigations on vacation models with clump appearances. Reneging during get-always in a lining framework has been another endeavour that has been undertaken right now. Furthermore, setup time organize is a recently included parameter right now. [3] K S Dhanalakshmi and S Maragathasundari have explored a lining approach in Mobile specially appointed systems issue. [10] S Maragathasundari and S Srinivasan considered a Non-Markovian Multistage Batch appearance line with breakdown and reneging. [16] S Srinivasan and S Maragathasundari prepared a report on Optional administrations in a Non-Markovian Queue. [17] S Vignesh and S Maragathasundari undertook an analysis of Non-Markovian single server group appearance queuing arrangement of mandatory administrations and administration interference. [15] S Sowmiah and S Maragathasundari examined the exhibition proportion of mass information line with N kind of extra discretionary assistance. Mass lining model of discretionary second stage administration with short and long excursions have indeed been characterized by [7] S Maragathasundari and K Karthikeyan Rajadurai P.et.al. contemplated the cost advancement examination of retrial line with K discretionary periods of administration under various working vacations. The lining model of discretionary kind of administration with administration stoppage and redo process in web facilitating lining was thoroughly examined by [8] S Maragathasundari and Miriam Cathy Joy. [1] B Balamurugan and S Maragathasundari contemplated the investigation of a cluster appearance line with two phases of administration Bernoulli plan vacation. [5] S Maragathasundari undertook an investigation of mass appearance lining model of three phases of administration with various get-away strategies. [11] Monita Baruah built up a clump appearance line with second discretionary assistance and reneging during get-away periods. [2] V Chandrasekaran et.al provided a succinct overview of working get-away lining models. A Non-Markovian Batch Arrival Queue with administration interference lining model was entrenched by [14] Sathiya K and Ayyappan G. The discretionary control of an M’x/G/1 untrustworthy server line with two periods of administration were contemplated in detail by [4] Gautamchodhuryand LotfiTadj. Similarly, an assessment on the lining arrangement of general help circulation with a foundation time and second optional organization was alluded to by [6] S Maragathasundari. Analogously, cost optimization analysis of retrial queue with K optional phases of service under multiple working vacations and random breakdowns was carried out by [13] Rajadurai Pet.al. An examination on Queuing Classification in Non-Destructive Testing was done by [12] S Sowmiyah et.al. An Investigation on Mathematical Modelling in Non-Markovian Queue was concluded by [9] S Maragathasundari and S Radha.

2. Definitions
2.1. Setup time
Setup time assumes a critical job in the investigation of lining frameworks, which is characterized as follows: at each completion of the bustling time frame, the server goes into an arbitrary arrangement time process before really offering support to another client, or a group of clients joins the framework in the reestablished occupied period.

2.2. Reneging
The point when an individual joining a line leaves without being served is generally contemplated in the lining writing. The more drawn out clients pause, the more disappointed they are probably going to be.

2.3. Vacation
Vacation is characterized as taking a break from your normal work to do any support work in the server as it helps to reduce the service interruption; likewise, any pre handling work is to be done in the event it is essential for the following phase of administration.
3. Application of the Model Defined

3.1. Setup time
In setup time, we shall monitor some of the factors like Burner assembly service, Bucket filter cleaning, Pre heater tank, oil pump service, Nozzle service. Under the Burner assembly service, we are going to service the parts of the burner assembly. The parts are electrode, Visual glass, divisor plate. While the thermo pack is in a running condition, these parts are been fixed. Therefore, the ash is formed around the surface of these parts. This ash is removed and cleaned. Thus, these parts must be free from the ash before the process. The next major part is bucket filter cleaning; in which plays a major role in removing the impurities present in the furnace oil. Since, the furnace oil is in an amalgam state, the presence of impurities is high. Therefore, the filter is serviced and made free from impurities. The next part is the Nozzle, a very minute part so that, that part must be free from impurities. It must be serviced before the process. Otherwise, it could create the back pressure and cause malfunction in the process. Pre heater tank is been serviced by monitoring the water level indicator present in the thermo pack. The water level starts to decrease during the process. Thus, it must be serviced properly. Hot pumps are serviced, so that they are free from leakages. The leakages must be minimized so that the usage of raw materials can be minimized. At the same time, some secondary services like current consumption and pump couplings are also been serviced.

3.2. Reneging (During the Setup time stage)
At the end of this process, the used-out oil passes through the pipe and approaches the stage 1 process (thermo pack-heating process). The oil is tested on the basis of the carbon content present in it before it is allowed into the thermo pack. If the oil has very less amount of carbon, then it is allowed inside the thermo pack and the process resumes. If the oil has a very high amount of carbon content, it cannot be used for the process, which is why it is removed. This removal process is defined to be reneging in terms of queuing theory.

3.3. Stage 1 (Thermo pack Heating process)
The oil with less carbon content is allowed to flow inside the thermo pack. This is when the heating process begins. The working of thermo pack is similar to the working of gas stove used in our day today application. The furnace oil is converted into a liquid form. This furnace oil is allowed to flow through the Nozzle with high velocity. The outlet of Nozzle is very minute in shape. The furnace oil that comes out from the Nozzle is in the form of a gaseous state. The electrode acts as a lighter and ignites the furnace oil. Thus, the heating process occurs. The oil present inside the thermo pack starts to heat. We opine that our required temperature to be produced by oil is for 185° C. The temperature of thermo pack (oil) varies in seasons. The boiler temperature of the thermo pack rises up to a temperature of 210° C so that the temperature around our mold is achieved during the winter season. The temperature of the thermo pack is 185° C in summer season. Thus, the functioning of thermo pack is similar to that of the gas stove. When the gas is furnace oil and electrode is lighter, the system to be heated is the olive oil.
Before commencing the second stage process, we need to undergo some service. These services enrich the quality of the process. In this instance, there is a total of 72 molds. These 72 molds are grouped in 4 molds referred to as presses. Therefore, there is a total of 18 presses in our plant. Each press consists of 2 pumps: upper pump and lower pump. These pumps are serviced properly before entering stage 2. These pumps contain many pipes connection. Each and every press is been serviced properly. Based on our consumption, the upper pump is set up to a value of 150-155 °C and for the lower pump; the values are 145-150 °C.

Hot oil pipelines are the veins of the machines by carrying all the hot oils and delivers to their respective press. These pipe lines flow all over the unit. Their role is the same as that of veins in our human system. Thermo pack is the heart of this process and also functions the pumping mechanism.
3.5. Preprocessing work of stage 2
During non-working days, we won't run the system. The oil present inside the pipe lines starts to change its state from liquid to amalgam state. In this case, the oil won't allow the fresh oil to get inside the pipelines. Thus, they act as a barrier inside the pipe lines. We need to remove the stagnant oil particle before using Toluene. This Toluene dissolves the oil and clears the pipe line free from barriers. This process enriches the flow of oil regular and makes it free from dust particles. This is a very important preprocessing to be done before the initiation of stage 2. Also, as a next preprocessing work, we introduce melamine box around the mold, so that the temperature is concentrated only inside the mold and stops the heat transfer outside the box. If the melamine box is introduced, the temperature inside the melamine box is 150°C and the temperature outside the melamine box is around 60°C. Therefore, the workman is free from hot temperatures around the mold.

3.6. Reneging process
The oil is allowed only as per the requirement of temperature around the mold. If the flow of oil is continuous around the mold, then the temperature of the mold will be raised. It leads to the non-occurrence of the raw materials solidification. To sort this out at this stage, we use 3-way valve. This valve comprises three parts. They are Inlet valve, Outlet valve and Drain valve. This valve has a diaphragm material connect to the inlet valve. The inlet valve is connected to inline of the header line. This diaphragm system is connected to the temperature sensor. This temperature sensor senses the temperature around the mold and sends the data to the diaphragm system. Based on the temperature the oil is allowed around the mold. This required oil flows from inlet valve to the outlet valve. If the mold temperature is maintained, then the oil flow is stopped and the remaining oil is allowed to flow from inlet valve to the drain valve. This drain valve is connected to the outline of the header line. This is how the process of reneging takes place.

![Figure 3](image-url)

**Figure 3**
Three-way valve is the checking inspector of the hot oil. It consists of a diaphragm at the crown position of the valve. This diaphragm is connected with the inlet valve. The motion of diaphragm is monitored by the pressure action, which, in turn, is connected with the compressor.
3.7. Stage 2

In stage 2, we allow the flow of oil around the mold. The oil circulation must be steady and constant. If the flow of oil is high, then the temperature of the mold is deemed to be raised. If it is low, then the temperature of mold drops. This process works similar to the heating of the object using the candle. In the candle, the temperature is raised when the object is kept for some time. If the object is reducing the temperature by a continuous flow, then the temperature of object is not raised and remains in the initial condition. Here, the process is reversed. We raise the temperature of the mold by the continuous flow of oil around the mold. The temperature of the mold starts to decrease when it is kept idle. Finally, based on our required condition, a temperature of 150° C is maintained around the mold.

![Figure 4](image)

Press is the die portion of the system and it is the molding area of the product. The bottom die is fixed, whereas the upper one is movable. Based on the product, the movement and the position of the die is judged. They usually consist of large weights and consume a lot of time for the assembly of the unit. The painting is given to the press for a better assembly during the replacement of the die.

On the whole, in stage one, the temperature of the oil is raised with the help of thermo pack. The temperature of oil raised based on the required amount of the work piece to be molded. During the oil transmission, we face some barriers such as heat loss, leakages, malfunction of the pumps, etc. These barriers are been serviced properly, after which the oil is allowed for stage two process. The hot oil temperature around the mold will be maintained inside temperature of the mold. Finally, we achieve the destiny by maintaining temperature in the mold. This temperature facilitates the casting process. The process is followed by many manufacturing industries even to this day.

4. Notations

\(k_n^{(1)}(x)\) - This indicates the probability of happening during the first stage of service for \(n\) number of clients. 
\(k_0^{(1)}(x)\) - This indicates the probability of happening during the first stage of service for zero number of clients. 
\(k_n^{(2)}(x)\) - This indicates the probability that the \(n\) number of customers in the second stage of service. 
\(k_0^{(2)}(x)\) - This indicates the probability that there are zero customers (or) no customers in the second stage of service. 
\(L_n(x)\) - This indicates the probability that there are \(n\) number of customers in the Setup time. 
\(L_0(x)\) - This indicates the probability that there are zero customers (or) no customers in the Setup time. 
\(V_n(x)\) - This indicates the probability that there are \(n\) number of customers in the Vacation. 
\(V_0(x)\) - This indicates the probability that there are zero customers (or) no customers in the Vacation.
5. Numerical suspicions of the model

Clients land in bunches follows a Poisson circulation, and Reneging is expected to follow exponential appropriation with parameter $\xi_1$ and $\xi_2$.

Let $\gamma_{k1}(x)$ be the restricted probability of stage 1 service with allotment function $K^{(1)}(x)$ and density function $k^{(1)}(x)$. Therefore, $\gamma_{k1}(x) = \frac{k^{(1)}(x)}{1-K^{(1)}(x)} = \gamma_{k1}(x) \exp\left[-\int_0^x \gamma_{k1}(v) dv\right]$.

Likewise, for the various parameters, we have

$$\gamma_{k2}(x) = \frac{k^{(2)}(x)}{1-K^{(2)}(x)} = \gamma_{k2}(x) \exp\left[-\int_0^x \gamma_{k2}(v) dv\right]$$

$$\mu(x) = \frac{l(x)}{1-L(x)} \text{ and } l(x) = \mu(x) \exp\left[-\int_0^x \phi(v) dv\right]$$

$$\varphi(x) = \frac{v(x)}{1-v(x)} \text{ and } v(x) = \varphi(x) \exp\left[-\int_0^x \varepsilon_k(v) dv\right]$$

6. Prevailing equations of the mold (model)

Based on the defined model, the following equations are framed by the usage of birth and death strategy.

For the $M/G/1$ queuing system we have the following

$P \text{ (no arrival during } (t, t + \Delta t)) = 1 - \lambda \Delta t + o(\Delta t) = 1 - \lambda \Delta t$

$P \text{ (one arrival during } (t, t + \Delta t)) = \lambda \Delta t + o(\Delta t) = \lambda \Delta t$

$P \text{ (more than one arrival during } (t, t + \Delta t)) = o(\Delta t)$

$P \text{ (no arrival completes his service during } (t, t + \Delta t)) = 1 - \mu(x) + o(\Delta t) = 1 - \mu(x) \Delta t$

$P \text{ (one arrival completes his service during } (t, t + \Delta t)) = \mu(x) + o(\Delta t) = \mu(x) \Delta t$

$P \text{ (more than one arrival completes his service during } (t, t + \Delta t)) = o(\Delta t)$

For more details about the above probabilities we have referred Kashyap & Chaudhry (1988).

\[
\frac{\partial}{\partial x} k^{(1)}_n(x) \left( \lambda^k + \gamma_{k1}(x) \right) k^{(1)}_n(x) = \lambda^k k^{(1)}_{n-1}(x) \quad (1)
\]

\[
\frac{\partial}{\partial x} k^{(2)}_n(x) \left( \lambda^k + \gamma_{k1}(x) \right) k^{(2)}_n(x) = \lambda^k k^{(2)}_{n-1}(x) + \xi_2 k^{(2)}_{n+1}(x) \quad (2)
\]

\[
\frac{\partial}{\partial x} l^{(2)}_n(x) + \left( \lambda^k + \mu(x) + \xi_1 \right) l^{(2)}_n(x) = \lambda^k l^{(2)}_{n-1}(x) + \xi_1 l^{(2)}_{n+1}(x) \quad (3)
\]

\[
\frac{\partial}{\partial x} v^{(2)}_n(x) + \left( \lambda^k + \varphi(x) + \xi_2 \right) v^{(2)}_n(x) = \lambda^k v^{(2)}_{n-1}(x) \quad (4)
\]

\[
\lambda^k Q = \int_0^\infty k^{(2)}_0(x) \gamma_{k2}(x) dx \quad (5)
\]

**Boundary and Initial conditions**

\[
L_n(0) = \int_0^\infty k^{(2)}_{n+1}(x) \gamma_{k2}(x) dx + \lambda^k Q \quad (10)
\]

\[
k^{(2)}_n(0) = \int_0^\infty v^{(2)}_n(x) \varphi(x) dx \quad (11)
\]

\[
v^{(2)}_n(0) = m \int_0^\infty k^{(1)}_n(x) \gamma_{k1}(x) dx \quad (12)
\]

\[
k^{(1)}_n(0) = \int_0^\infty l_n(x) \mu(x) dx \quad (13)
\]

7. Supplementary variable approach

Solving of (1) to (8)
Applying the supplementary process, we end up in the following equation:
\[
\frac{\partial}{\partial x} K^{(1)}(x, z) + \left( \lambda^k - \lambda^k z + \gamma_{k1}(x) \right) K^{(1)}(x, z) = 0 \tag{14}
\]
Similarly,
\[
\frac{\partial}{\partial x} K^{(2)}(x, z) + \left( \lambda^k - \lambda^k z + \gamma_{k2}(x) \right) K^{(2)}(x, z) = 0 \tag{15}
\]
\[
\frac{\partial}{\partial x} V(x, z) + \left( \lambda^k - \lambda^k z + \varphi(x) + \xi_z - \xi_z \right) V(x, z) = 0 \tag{16}
\]
\[
\frac{\partial}{\partial x} L(x, z) + \left( \lambda^k - \lambda^k z + \mu(x) + \xi_1 - \xi_1 \right) L(x, z) = 0 \tag{17}
\]
Same procedure is applied for initial and boundary conditions
\[
zL(0, z) = \int_0^\infty K^{(2)}(x, z) y_{k2}(x) dx - \int_0^\infty K^{(2)}_0(x, z) y_{k2}(x) dx + \lambda^k zQ \tag{18}
\]
\[
K^{(1)}(0, z) = \int_0^\infty L(x, z) \mu(x) dx \tag{19}
\]
\[
K^{(2)}(0, z) = \int_0^\infty V(x, z) \varphi(x) dx \tag{20}
\]
\[
V(0, z) = m \int_0^\infty K^{(1)}(x, z) y_{k1}(x) dx \tag{21}
\]
Now, integrating (14) from 0 to x yields,
\[
L(x) = L(0, z) e^{-\left( \lambda^k - \lambda^k z + \xi_1 - \xi_1 \right) x - \int_0^x \mu(t) dt} \tag{22}
\]
Integrating (22) by parts with respect to x, yields
\[
L(x) = L(0, z) \left[ 1 - \frac{L(a)}{a} \right] \tag{23}
\]
Where,
\[
\alpha = \lambda^k - \lambda^k z + \xi_1 - \xi_1
\]
On carrying out \( \int_0^\infty \) Eq (22) \( \mu(x) \) \( dx = \int_0^\infty L(0, z) e^{-\left( \lambda^k - \lambda^k z + \xi_1 - \xi_1 \right) x - \int_0^x \mu(t) dt} \mu(x) dx, \)
we get
\[
\int_0^\infty L(x, z) \mu(x) dx = L(0, z) \bar{L}(a), \tag{24}
\]
\[
K^{(1)}(x) = K^{(1)}(0, z) \left[ \frac{1-R^{(1)}(b)}{b} \right], \text{ where } b = \lambda^k - \lambda^k z \tag{25}
\]
\[
\int_0^\infty K^{(1)}(x, z) y_{k1}(x) dx = K^{(1)}(0, z) \bar{L}(a) \tag{26}
\]
\[
K^{(2)}(x) = K^{(2)}(0, z) \left[ \frac{1-R^{(2)}(b)}{b} \right] \tag{27}
\]
\[
\int_0^\infty K^{(2)}(x, z) y_{k2}(x) dx = K^{(2)}(0, z) \bar{L}(a) \tag{28}
\]
\[
V(x) = V(0, z) \left[ 1 - \frac{V(c)}{c} \right] \tag{29}
\]
\[
\int_0^\infty V(x, z) \varphi(x) dx = V(0, z) \bar{V}(c) \tag{30}
\]
Using (9) and (28) in (18), we get
\[
L(0, z) = \frac{1}{z - L(a) R^{(2)}(b) R^{(1)}(b) m \bar{V}(c)} \tag{31}
\]
Now, (23), (25), (27) and (29) becomes,
\[
L(x) = \frac{1}{z - L(a) R^{(2)}(b) R^{(1)}(b) m \bar{V}(c)} \left[ 1 - \frac{L(a)}{a} \right] \tag{32}
\]
\[
K^{(1)}(x) = \left( \frac{1}{z - L(a) R^{(2)}(b) R^{(1)}(b) m \bar{V}(c)} \right) \bar{L}(a) \left[ \frac{1-R^{(1)}(b)}{b} \right] \tag{33}
\]
\[
K^{(2)}(x) = m \bar{L}(a) \bar{L}(a) \left( \frac{1}{z - L(a) R^{(2)}(b) R^{(1)}(b) m \bar{V}(c)} \right) \left[ \frac{1-R^{(2)}(b)}{b} \right] \tag{34}
\]
\[
V(x) = m \bar{L}(a) \bar{L}(a) \left( \frac{1}{z - L(a) R^{(2)}(b) R^{(1)}(b) m \bar{V}(c)} \right) \left[ 1 - \frac{V(c)}{c} \right] \tag{35}
\]
8. Probability generating function of the queue size
Let \( M_q(z) \) be the probability of generating queue size; we get,
\[
M_q(z) = L(z) + K^{(1)}(z) + K^{(2)}(z) + V(z)
\]
\[ L'(z) = \frac{1}{a} \left[ L(a) \Gamma(1) + mR(1)(b)\Gamma(a) \frac{1}{c} \right] - L(a) \Gamma(1)(b) + mR(1)(b)\Gamma(c) \left( 1 - R(2)(b) \right) \]

The normalization condition \( K_q(1) + Q = 1 \), is used to determine \( Q \).

Using L'Hospital's rule, we get

\[ \lim_{z \to 1} K_q(z) = \frac{N(1)}{D(1)} \]

Next, we obtain idle time

\[ Q = \frac{D'(1)}{D(1) + N'(1)} \]

From \( Q \), the utilization factor \( \rho \) can be determined.

### 9. System queue execution procedures

Using L'H rule twice we obtain

\[ L_q = \lim_{z \to 1} \frac{D'(z)N'(z) - N'(z)D'(z)}{2(D'(z))^2} \]

Finding the derivative at \( z = 1 \), we have

\[ D'(1) = 1 + mE(L)(-\lambda_k + \xi_1) + E(K_2)\lambda_k - E(K_1)\lambda^k - E(L)\lambda^k + \left( \xi_1 - E(L)\lambda^k \right) + E(K_1)\lambda_k - \frac{E(K_2)\lambda^k + \lambda^k E(K_1)}{2} \]

\[ N'(1) = \lambda_k^k E(K_1) + \lambda_k mE(K_2) \]

Using little's formula we further get,

\[ L = L_q + \rho, \quad W_q = \frac{L_q}{\lambda}, \quad W = \frac{L}{\lambda} \]

### 10. Numerical justification of the model

Using the concept of exponential distribution for the service, the values are measured and numerical reports are then equipped.

\[ \gamma_k = 3, \gamma_{k2} = 3.5, \lambda_k = 4, \xi_1 = 2, \xi_2 = 2.5, \varphi = 2.8, \mu = 3.6, \]

| \( \gamma_k \) | \( \gamma_{k2} \) | \( \lambda_k \) | \( \xi_1 \) | \( \xi_2 \) | \( \varphi \) | \( \mu \) | \( E(K_1) \) | \( E(K_2) \) | \( E(L) \) | \( E(L^2) \) | \( E(V) \) | \( E(V^2) \) | \( E(K_1^2) \) | \( E(K_2^2) \) | \( E(K_1^2) \) | \( E(K_2^2) \) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.021 | 0.8979 | 56.6639 | 57.5619 | 14.1659 | 14.3905 |
| 1.551 | 0.8449 | 17.9353 | 18.7802 | 4.4838 | 4.6950 |
| 1.879 | 0.8121 | 9.2679 | 10.0797 | 2.3169 | 2.5199 |
| 2.102 | 0.7898 | 5.7464 | 6.5362 | 1.4366 | 1.6341 |
| 2.263 | 0.7737 | 3.8954 | 4.6691 | 0.9739 | 1.1673 |

Table 1. Effect of variation \( m = 1, 1.5, 2, 2.5, 3 \)

\[ 0.2263, 0.7737, 3.8954, 4.6691, 0.9739, 1.1673 \]
Likelihood of taking get-away assumes a noticeable part in the model characterized. Here excursion in the sense, we mean the course length of upkeep work. Excursion is made obligatory in this framework. As the likelihood of get-away builds, it prompts a legitimate upkeep work of the worker. Consequently the framework goes toward the path towards decline in all the execution measures. This demonstrates the framework as a gainful one.

Figure 5. Effect of variation $m$

| $\xi_1$ | $Q$ | $\rho$ | $L_q$ | $L$ | $W_q$ | $W$ |
|---------|-----|-------|------|----|------|-----|
| 3.6     | 0.0617 | 0.9383 | 295.9089 | 296.8472 | 73.9772 | 74.2118 |
| 3.8     | 0.081 | 0.9189 | 172.4053 | 173.3242 | 43.1013 | 43.3311 |
| 4.0     | 0.0996 | 0.9004 | 114.5955 | 115.4959 | 28.6489 | 28.8739 |
| 4.2     | 0.1174 | 0.8826 | 82.5629 | 83.4455 | 20.6407 | 20.8614 |
| 4.4     | 0.1345 | 0.8655 | 62.8964 | 63.7619 | 15.7241 | 15.9405 |
Impact of reneging during the arrangement time plainly demonstrates the fretfulness of the clients. Despite the fact that a few clients leave the framework because of anxiety, Set up time is expected to make the framework run smoother and it is unavoidable in the majority of the Queuing framework. To control the quantity of clients leaving the framework, time length invested for set up energy cycle might be decreased somewhat.

Figure 6. Effect of variation $\xi_1$

Table 3. Effect of variation $\xi_2 = 3.5, 4, 4.5, 5, 5.5$

| $Q$  | $\rho$ | $L_q$    | $L$   | $W_q$    | $W$   |
|------|--------|----------|-------|----------|-------|
| 0.0296 | 0.9704 | 1198.951 | 1199.922 | 299.7378 | 299.9804 |
| 0.093 | 0.9069 | 115.0902 | 115.9971 | 28.7726  | 28.9993  |
| 0.1487 | 0.8513 | 42.9946  | 43.8459 | 10.7487  | 10.9615  |
| 0.1979 | 0.8021 | 23.2565  | 24.0586 | 5.8141   | 6.0146   |
| 0.2418 | 0.7582 | 14.9881  | 15.7463 | 3.7470   | 3.9366   |

Again the idea of reneging plays during the hour of get-away. It is unavoidable despite the fact that the execution measures get decreased. In the event that the get-away time is excluded, at that point there won't be any legitimate upkeep work of the worker. It will bring to a worker separate which prompts the stoppage of entire framework.
11. Numerical Analysis

Table 1: As the probability of server vacation builds, the number of clients remaining in the line gets diminished while also prompting a reduction in the entire parameters true to form. As the number of clients reduces, the work gets completed sooner. As a result, the holding up time of clients remaining in the line just as it is in the framework gets decreased.

Table 2: Due to the occurrence of reneging in the set-up time, before the beginning of the administration, the line gets decreased and work gets completed sooner. It prompts the expansion out of the server’s gear time. At the same time, the usage factor diminishes.

Table 3: Due to impatience, clients leave the framework during the server’s get-away time. All the execution parameters Lq, L, Wq and W are decreased. Because of fewer clients, the usage factor diminishes and subsequently, the idle time Q of the server increases.

12. Conclusion

The above assessment provides a sense of reality on the coating issue, including various parameters such as arrangement time, reneging, excursion, defer time, and periods of organization occurring in the hypothesis tossing process. The assessment finished in the above Queuing issue entails procuring the probability of making limit of the line size and its relating lining execution estimates numerical assessment, whereas a pictorial depiction gives an unquestionable picture of the model characterized. As a future work, service interference can be considered and prompts a fix procedure system as well. Balking and confined admissibility can be considered with various get-away approaches and correspondence could likewise be mulled over for the above characterized models. All these models are used in ventures, correspondence process, and web planning and so on.
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