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MATHEMATICAL MODEL OF THE MASS MILITARY SERVICE SYSTEM

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Abstract
The department of public service theory of mathematics, among other theories, is widely used in the development of many mathematical and practical problems. This theory is important for its current state of public service, with its consistent mathematical methods aimed at analyzing and drawing conclusions and developing recommendations for service improvement.

Keywords: service, analysis, mathematical model, real system.

Introduction

Mass Habian service theory is one of the modern mathematical sciences concerned with the development of a mathematical model of mass Habian service processes. We come across a huge number of processes related to the implementation of a complex of repetitive operations on several objects, both in life, in life practice and, of course, in military practice.

For example:

1) repair of military cars by remont brigades;
2) crew service to military equipment;
3) fuel the machines;
4) analysis of the information received in the headquarters and hakozo.

These processes are called mass Habi service processes.

The analytical model of the mass Habi service process was developed mainly for the stationary state. One of the mathematical models developed to study the Real process, that is, one of the mathematical models that shows the real incoming flow of objects, service time, Service Order and queue order with the desired level of accuracy and reliability, is selected. The chosen model can be applied for both correct and inverse issues.

With the criteria chosen to solve the right issues, the real system is evaluated, the necessary conclusions are drawn, decisions are made to improve indicators.

To solve inverse problems, on the contrary, certain criteria of efficiency (efficiency) are given, with which the parameters of the system are selected accordingly. Inverse problems are solved when new mathematical models of mass Habi service systems are being newly constructed or have been modernized.

Issue 1. A mainteperenance unit consists of 5 (n=5) repair brigades, each of which can repair one tank at a time. Tanks brought to repair due to the experience of military actions and the capabilities of evacuation vehicles make up a simple flow with an intensity of $\lambda = 0{,}4\frac{\tan k}{soat}$.

While the service time of an object is subject to the exponential distribution law of intensity equal to $\gamma = 0{,}1\frac{\tan k}{soat}$, that is, if $t_{xiz} = 10\, soat$, evaluate the repair unit by efficiency criteria.

Undo. This issue is solved using a mathematical model to access a queue service system with unexpected flow in a public Habi service system.

1) We check the boundary condition of the queue: $4 < n < 5$ out of $\alpha = \frac{\lambda}{\gamma} = \frac{0{,}4}{0{,}1} = 4$, indicating that the order queue is bounded. Using $\lambda = 0{,}4\frac{\tan k}{h}$, $n = 5$, $\alpha = \frac{\lambda}{\gamma} = \frac{0{,}4}{0{,}1} = 4$,

$$p_0 = \left[\sum_{k=0}^{n}\frac{\alpha^k}{k!} + \frac{\alpha^n}{n!}\cdot\frac{\alpha}{n-\alpha}\right]^{-1} = \left(\sum_{k=0}^{n}\frac{4^k}{k!} + \frac{4^5}{5!}\cdot\frac{4}{5-4}\right)^{-1} = 0{,}013;$$

With the probability of cases, the efficiency criterion of the system is determined, namely

$$\bar{n}_{н} = \frac{\alpha^{m+1}}{(n-1)!(n-\alpha)^2}\cdot p_0 = \frac{4^6}{4!(5-4)^2}\cdot 0{,}013 = 2{,}2 \approx 2 \tan k,$$

$$\bar{t}_{kut} = \frac{\bar{n}_{н}}{\lambda} = \frac{2{,}2}{0{,}4} = 5{,}5h;$$

$$\bar{t}_s = \bar{t}_{kut} + \frac{1}{\gamma} = 5{,}5 + \frac{1}{0{,}1} = 15{,}5\, h;$$

$$k = \frac{\alpha}{n}\cdot 100\% = \frac{4}{5}\cdot 100\% = 80\%.$$

In the mass habiy service system, the average number of objects waiting for a queue and served will be as follows: $\bar{n}_{o'r} = \alpha + \bar{n}_{н} = 4 + 2 = 6.$

Conclusion: a repair unit will be able to complete the assignment if it works with a high performance, since each brigade will be occupied with completing the same assignment in 80% of its working time.

Issue 2. Under the condition of the above issue, we will solve the issue for Case ($n = 3$) in which two repair brigades have failed.

Since $\lambda = 0{,}4\frac{\tan k}{h}$, $n = 3$, $\alpha = \frac{\lambda}{\gamma} = \frac{0{,}4}{0{,}1} = 4$ to $\alpha > n$, i.e. 4>3, the number of tanks waiting for repair will increase over time. For this reason, the repair unit cannot complete the task on time with the tools and labor it has.

The employment level of service tools is found with formula $k = \frac{M(x)}{n}\cdot 100\% = \frac{\alpha}{n}\cdot q\cdot 100\%$.

This expression applies to both correct and inverse issues.

Issue 3. Air intelligence detected four objects in an hour, three on-duty shooters were allocated to destroy them. Shooting tools spend an average of 0.5 hours to destroy the object. In order not to quickly change the situation, the detected objects must be immediately fired. Determine the effectiveness of the throwing tools.

Undo. Preliminary data: $\lambda = 4$, $\bar{t}_{xiz} = 0{,}5$, $n = 3$.

If based on preliminary data, the shooting tools will destroy the target without words, since the average chance of destruction is $3 \cdot 2 = 6$ object per hour, while intelligence has detected 4 objects per hour. The work of the shooting Media can be viewed as the process of a mass Habi service system with approximately no queues. So

$$\gamma = \frac{1}{\bar{t}_{хиз}} = \frac{1}{0{,}5} = 2;$$

$$\alpha = \frac{\lambda}{\gamma} = \frac{4}{2} = 2;$$

Based on formulas $p_0 = (\frac{\alpha}{1!} + \frac{\alpha^2}{2!} + \ldots + \frac{\alpha^n}{n!})^{-1}$ and $p_{рад} = p_n = \frac{\alpha^n}{n!} \cdot p_0$ and tables $\alpha = 2$ and $n = 3$,

$p_0 = 0{,}16$, $p_{rad\ etish} = p_3 = 0{,}21$.

$q = 1 - p_{рад} = 1 - p_n$ va $A = \lambda \cdot q = (1 - p_n) \cdot \lambda$ according to the formulas

$$q = 1 - p_{рад} = 1 - 0{,}21 = 0{,}79;$$

$$k = \frac{M(x)}{n} \cdot 100\% = \frac{\alpha}{n} \cdot q \cdot 100\% = \frac{2}{3} \cdot 0{,}79 \cdot 100\% = 53\%;$$

Separated shooting tools can destroy an average of 80% of enemy objects. To accomplish this task, the shooters spend 53% of the time of their shift. The reason for the incorrect output of the initial data was that random factors were not taken into account.

References

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