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WAYS AND METHODS OF EFFICIENCY INCREASING OF THE INDEPENDENT AUTOMATED TEST SYSTEMS OF RADIO-ELECTRONIC DEVICES

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Abstract—Ways and methods of construction of the automated test systems of radio-electronic technique objects are investigated in the article. The basic directions of improvement of existing test systems are defined.

Index Terms—The automated test systems; a method.

I. INTRODUCTION

Modern objects of radio-electronic technique (RET) represent difficult technical systems which are modules joint of different physical performance and appointment. Systems, which have appeared at first in atomic engineering and astronautics, have found wide usage practically in all spheres of live.

II. THE ANALYSIS OF A PROBLEM

Maintenance of their high reliability [1] is one of the basic requirements which concern to RET at an operation phase. Reliability of RET depends on many indicators among which defining are an average operating time to refusal and average duration of restoration. Time of control of a technical state and time of malfunction localization to not folding element of the radio-electronic device is a component of duration of restoration. The solving of the given problems are put on means of technical diagnostics RET, in particular on the built in monitoring systems and diagnostics (BMSD).

Maintenance of BMSD set parameters, is a difficult scientific and technical problem which is caused by variety of factors. Especially it is necessary to note complexity of an BMSD indicators assessment of RET objects. It is connected not only with use by different developers of different techniques for an equipment assessment, but also the different nature of modules (electric, mechanical, electronic etc.). Besides, information on complexity of modules is absent often, and a problem of a comparative assessment of modules with the different nature or combined is poorly studied. Besides, usage of BMSD brings to variety cases of attendants impossibility to get access to a number of systems without presence of the special equipment.

III. THE BASIC PART

Solution of the certain scientific and technical problem is probable by using last achievements in the field of microelectronics and information technology (IT). These objects are supposed for modern RET working out and uses of the effective independent automated systems of diagnosing (IASD. However, today there are no unified approaches to creation of such systems. Besides, principles of reception of the diagnostic information are not developed completely to AA SD RET.

The main principles of AA SD RET construction are proved in the article. The contactless induction method and a method of own radiation for control of technical RET condition and defects localizations are offered for a basis. These methods give the chance to spend malfunctions diagnosing of digital devices on unified methodological and technical base.

Maintenance of set operational-technical characteristics of RET with diagnostics tools represents unified process which covers all basic stages of life: designing, manufacture and operation, namely:

– by working out of RET possibility to provide its IASD which should correspond to forward requirements;

– it is established theoretical part during designing, and actual conformity of parameters of IASD to the set requirements is established in the course of manufacturing and tests;

– parameters of IASD are supported by the correct organization of operation after manufacturing.

So, maintenance of the IASD set parameters is a complex scientific and technical problem which covers a wide range of gnoseological, scientific (mathematical, physical and chemical, biological), engineering (design, industrial-technological, operational) and economic aspects. The solution of this problem is connected with realization of numerous organizational and technical, and is frequent also fundamental scientific researches which demand the big expenses of time and means, and also concerns different areas of a science and technique.

The analysis of existing and perspective AA SD RET has found out the basic lacks which are inherent for these.

The first lack is defined by the possibility of control of the greatest possible quantity of types of components of RET objects under condition of maintenance of the set reliability of carrying out of diagnosing for admissible time is one of the basic requirements to IASD. Diagnosing of available digital elements and devices or typical elements of replacement (THESES) existing methods is connected with application of a considerable quantity of measuring devices, measurement of different diagnostic parameters in many control points and low efficiency of information technology usage. Thus necessary accuracy, speed and the diagnosing cost price is not provided. It causes the necessity of a new quality monitoring which would allow providing necessary reliability of diagnosing at reduction of number of diagnostic parameters and control points, automation of measurement of these parameters, usage of the universal measuring device.

The second lack is caused by presence in operation of RET objects which have been designed and made in 70 and 80th years XIX century. That leads to discrepancy of СТД possibilities of these RET objects to modern requirements.

The third lack is defined by the absence of complete scientific theory of technical operation of difficult systems, and also the universal engineering techniques of a choice developed on its basis and a substantiation of optimum structures, modes and the organization of system maintenance service and repair of a different special-purpose designation RET objects. Therefore IASD which are realized in RET objects, are under construction by different principles. It use different methods and means of diagnosing carrying out. It leads to that efficiency of existing IASD of RET objects does not meet modern requirements.

The fourth lack is caused by the question of maintenance of high maintainability of RET objects takes away insufficient attention, especially by what are executed on the basis of big and over the big integrated schemes (BIC, HBIC). Therefore there is no scientifically well-founded system of restoration and repair of RET objects which considers their structure, structure, setting, features of operation.

The fifth lack is caused by absence, and also insufficient working out and realization of new effective methods, algorithms and means of the automated and automatic diagnosing and search of elements of RET object which have refused, that is the independent automated systems of diagnosing of RET objects.

These lacks lead to that the independent automated systems of diagnosing of RET objects that constructed on the basis of existing methods and techniques, are ineffective and do not meet modern requirements. Therefore at operation existing and creation of new perspective RET objects it is necessary to define ways and methods of elimination of the given lacks.

RET objects for which control intended IASD are made of a wide range of different radio-electronic devices which are constructed by different principles and technologies. Therefore maintenance of unified approaches to reception and processing of the diagnostic information on a technical condition (TC) of digital devices is the first effective way of achievement of the set characteristics of IASD.

The second effective way of IASD characteristics maintenance is improvement of principles of the organization and AA SD structure during service. For AA SD RET a significant amount of works, in which considered theoretical bases of the organization and structure AA SD of systems of different function is devoted theoretical research of questions of reception and processing of the diagnostic information. In a smaller measure the investigated questions of reception of the diagnostic information for different types of digital devices. However these questions completely define suitability of RET objects to control, it means [2] object fitness to diagnosing and ability of IASD to operative revealing of refusals. At the same time, control maintenance at designing and operation at the expense of construction of optimum AA SD structure and the organization of its work results equipments not only in reduction of idle times, but also essentially raises RET efficiency. For this reason researches of questions of reception and processing of the diagnostic information it should be spent together with studying of different images of construction of IASD and increase RET control.

Thus, it is possible to draw a conclusion on necessity of usage the system approach to maintenance of the set parameters of the independent automated systems of diagnosing of objects RET. Such approach means practical realization of the general dialectic method of knowledge concerning studying of difficult technical objects. The system approach in a broad sense is the complex interconnected consideration of all parties and aspects, stages and directions at the decision of different problems of practice which own high degree of complexity, uncertainty, multi-variant approach and integrity [3].

From the point of view of methods of reception and processing of the diagnostic information for AA SD RET, realization of the system approach means complex use of mathematical models and diagnosing tests, studying of the general and partial properties of different kinds of IASD for reception and processing of the diagnostic information on a camp of different types of digital devices.

Main principles of the system approach at the task solution on maintenance of the set parameters for the independent automated test systems in RET can be formulated as follows [4]:

1. A principle of the system approach. The given principle gives the chance to consider AA SD in a complex with RET that allows to provide a maximum of an efficiency indicator of its operation.

2. A universality principle. It provides possibility of reception and processing of the diagnostic information for different types of digital schemes with defined time and the period of control and to lead the information on their technical condition to one kind.

3. A hierarchy principle. It defines an order of reception and processing of the diagnostic information from the general systems to separate devices and elements depending on RET structure and methods of IASD construction.

4. A principle of continuous system development. It provides possibility of fast replacement of work algorithms, constant replenishment of IASD data-bases, and also introduction of new criteria at decision-making.

5. An adaptability principle. It provides possibility to change AA SD structure in certain borders at their realization in different RET.

6. A principle of maintenance of the mutual coordination of the basic characteristics of the independent automated systems of diagnosing with indicators of RET reliability in which these IASD are applied. It means that requirements which are shown to the independent automated systems of diagnosing are proved, proceeding from maintenance of the set level of reliability RET as a whole.

7. A principle of the proportional-consecutive solution of all complexes of interdependent problems which enter into research. The principle provides the solution of problems in strictly certain logic sequence. Thus attention is taken away to the most important and least investigated questions.

8. A principle of integrity maintenance concerning separate stages and problems. Researches which are spent at different stages (studying of properties of digital schemes, their general consideration, research of methods of reception and processing of the diagnostic information, experimental check and practical introduction of the basic scientific results), subordi-nates of the unified purpose. The results received at separate stages, winning back the subordinated role from a sight of achievement of an overall aim, at the same time can represent and independent interest and influence research process.

9. A principle of the weighed efforts. It provides rational (optimum) distribution of efforts (the limited means) between methods of reception and processing of the diagnostic information on the TC of digital devices according to real conditions and admissions at which problems are solved.

As it is known, cognition process of new quality of the difficult phenomenon (integration) indissolubly intertwines with process of differentiation (decomposition), studying of the separate parties and properties of this phenomenon with application most effective remedies for it knowledge. Therefore the method of separate research and the analysis of compound problems is put in a basis of complex research of diagnosing RET process in conformity to the principles stated above and generalizing synthesis of the received results.

Generalizing certain principles it is possible to draw a conclusion on possibility of construction of highly effective IASD on the basis of use of the advanced achievements in the field of information technology at reception and processing of the diagnostic information.

Therefore it is offered to conduct scientific researches behind following basic directions:

– development of the unified repair, diagnostic modules and control units of a technical condition;

– development of the specialized diagnostic equipment for digital devices;

– development of the automated systems of RET diagnosing with use of information technology.

IV. Direction of the further researches

Direction of the further researches – creation of maintenance technology of the set parameters for AA SD RET. At the present stage of development of a science and technique there is a possibility of creation of technology which will define scientific bases of new methods of reception and processing of the diagnostic information on digital RET devices.

Conclusions

The main result of the current research is an invention of algorithm for generalized base and conceal Galois and Fibonacci matrixes the elements As a result of the spent analysis:

Lacks of the existing built in monitoring systems and diagnostics RET are defined.

Main principles and methods of reception and processing of the diagnostic information for AA SD

RET on the basis of achievements in the field of information technology and microelectronics are defined.

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М. К. Жердєв, Б. П. Креденцер, В. В. Кузавков. Шляхи і методи підвищення ефективності автономних автоматизованих систем технічного діагностування радіоелектронних пристроїв
Досліджено шляхи і методи побудови автоматизованих систем технічного діагностування об'єктів радіоелектронної техніки. Визначено основні напрямки вдосконалення існуючих систем технічного діагностування.
Ключові слова: автоматизовані системи технічного діагностування; метод.

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М. К. Жердев, Б. П. Креденцер, В. В. Кузавков. Пути и методы повышения эффективности автономных автоматизированных систем технического диагностирования радиоэлектронных устройств

Исследованы пути и методы построения автоматизированных систем технического диагностирования объектов радиоэлектронной техники. Определены основные направления совершенствования существующих систем технического диагностирования.

Ключевые слова: автоматизированные системы технического диагностирования, метод

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