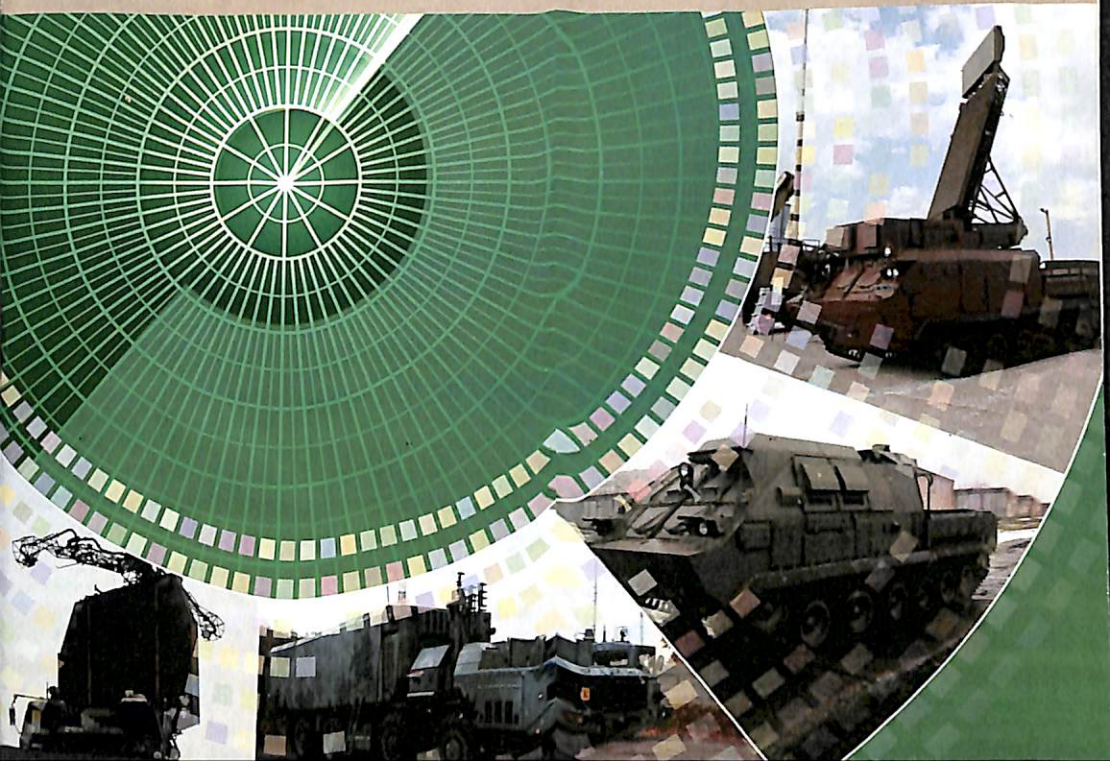
RESEARCH OF AUTOMATIC CONTROL SYSTEM QUALITY INDEXES IN STEADY STATE AT DETERMINISTIC ACTS

Methodical recommendations for laboratory work



MINISTRY OF DEFENCE OF UKRAINE
IVAN KOZHEDUB KHARKIV NATIONAL UNIVERSITY
OF AIR FORCE

RESEARCH OF AUTOMATIC CONTROL SYSTEM QUALITY INDEXES IN STEADY STATE AT DETERMINISTIC ACTS

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Research of automatic control system quality indexes in steady state
Р43 at deterministic acts : methodical recommendations for laboratory work . – [I.I. Sachuk, A.V. Kalyta, V.M. Orlenko et al.] . – Kh. : KhNUPS, 2020. – 36 p.

The tasks and methods for carrying out the laboratory work "Research of automatic control system quality indexes in steady state at deterministic acts" are considered in the methodical recommendations for laboratory work. Also the theoretical information and questions are given.

The methodical recommendations are intended to provide the educational subjects "The theory of automatic control systems of anti-aircraft missile armament", "The theory of automatic control" and a number of other educational subjects, which are studied by cadets and students of Ivan Kozhedub Kharkiv National University of Air Force and students of radio engineering and electromechanical specialties of polytechnic and aerospace universities.

У методичних рекомендаціях викладені завдання і методика виконання лабораторної роботи "Дослідження якості функціонування систем автоматичного керування в усталеному режимі при детермінованих вхідних діяннях", а також наведені теоретичні відомості та питання для самоконтролю.

Призначені для забезпечення навчальних дисциплін "Теорія систем автоматичного керування зенітного ракетного озброєння", "Теорія автоматичного управління" і ряду інших навчальних дисциплін, які вивчаються курсантами та студентами Харківського національного університету Повітряних Сил імені Івана Кожедуба і студентами радіотехнічних та електромеханічних спеціальностей політехнічних і аерокосмічних університетів.

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FOREWORD

The methodical recommendations are intended to provide the educational subjects "The theory of automatic control systems of anti-aircraft missile armament", "The theory of automatic control" and a number of other educational subjects which are studied at the training of cadets and students in the field of knowledge 17 "Electronics and Telecommunications" in specialty 172 "Telecommunications and radio engineering", in the field of knowledge 14 "Electrical engineering" in specialty 141 "Power engineering, electrical engineering and electromechanics", in the field of knowledge 15 "Automation and instrumentation" for specialty 152 "Metrology and measuring equipment of troops (forces)", in the field of knowledge 12 "Information technologies" for specialty 123 "Computer engineering" and also students of radio engineering and electromechanical specialties of polytechnic and aerospace universities.

Samples of antiaircraft missile armament are compound technical systems which contain not only radars for detecting and tracking air targets but also anti-aircraft guided missiles and launchers for launching and guidance of anti-aircraft guided missiles to target. At the same time, after locking target to tracking, majority of operations are carried out automatically, without the participation of combat crew personnel. Consequently, samples of anti-aircraft missile armament first consist of a great number of automatic control systems of various purposes, which include a large number of radio-electronic and electromechanical devices of different principles of operation and secondly it is one large control system which provides air targets destruction.

Three typical input acts are most often used for control systems. They are a constant act which corresponds to rotation of cabin in a given direction or a constant value of target coordinate; a linear act which corresponds to rotation of the antenna system or change of target coordinate with constant velocity and quadratic act which corresponds to accelerated change of target coordinate , for example, when target makes maneuver. In this case, the possibility of error-free working out (working out with a certain permissible error) by the control system of the input act is determined by the structure and parameters of the system. The laboratory work is devoted to the research of the influence of the structure and parameters of system on value of system error in the three typical input acts which correspond to the typical operation modes of target tracking systems that are implemented in samples of anti-aircraft missile armament.

The methodological recommendations consist of the general theoretical information, tasks for laboratory work and recommendation for carrying out the laboratory work, questions and algorithm for defense of the laboratory work. For the successful study of the material of the educational subject and the defense of laboratory work it's necessary to know the theoretical information which is given in the methodical recommendations.

The multiyear experience of teaching a number of educational subjects in Ivan Kozhedub Kharkiv National University of Air Force, Kharkiv Military University and Leonid Govorov Military Engineering Radio Engineering Academy of the Air Defense is accounted.