"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

NYURENBERG, Vladimir Arkad'yevich; MLODZEYEVSKAYA, Irina Aleksandrovna; YEFIMOV, A.P., otv. red.; FUFAYEVA, M.N., red.; CHURAKOVA, V.A., tekhn. red.

[Fundamental principles of the design of automatic broadcast level regulators] Osnovnye polozheniia po raschetu avtomaticheskikh reguliatorov urovnia veshchatel'nykh peredach. Moskva, Svias'izdat, 1963. 52 p. (MIRA 16:10)
(Radio--Transmitters and transmission)

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

68326

24,3410 SOV/51-8-1-32/40

AUTHORS: Kovner, M.A., Karyakin, A.V. and Yefimov, A.P.

TITLE: Characteristic Frequencies of the Hydroperoxide Group C--O--O--H

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 1, pp 128-130 (USSR)

ABSTRACT: The authors discuss vibrational frequencies of the hydroperoxide group C--O--O--H. Studies of the infrared spectra of hydroperoxides showed that the C--O--O--H vibrations have the following frequencies: 840, 880, 1155, 1325, 3450 $cm^{-1}$. These frequencies were tentatively assigned to $\delta$(COOH), $\nu$(O--O), $\nu$(C--O), $\delta$(O--H), $\nu$(O--H), respectively. The corresponding frequencies of C--O--O--D were found at 800, 855, 995, 1155, 2550 $cm^{-1}$ in the spectrum of isopropylbenzene peroxide (Ref 2). Analysis of the two sets of frequencies shows that they are incomplete. Firstly a non-linear chain consisting of four atoms should have six vibrational frequencies and secondly the reported data suggest that the frequencies of vibrations of the angle XYZ (X, Y and Z are the heavy atoms) lie below 600 $cm^{-1}$, i.e. in the two sets of values (given above) the frequency $\delta$(COO) is absent. This was confirmed experimentally by the discovery of a very intense line at 585 $cm^{-1}$ in the spectrum of isopropylbenzene hydroperoxide (cf. curve 1 in a figure on p 128). This line was interpretted as $\delta$(COO) of the COOH group. The corresponding frequency in the COOD group is unfortunately not known. The 840 $cm^{-1}$

Card 1/3

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SOV/51-8-1-32/40

Characteristic Frequencies of the Hydroperoxide Group C--O--O--H

frequency, previously denoted by $\delta$(COOH) can now be assigned to vibrations of a dihedral angle $\chi$ between the plane COO and OOH. Since the geometry of the hydroperoxide group in isopropylbenzene was not known the authors used geometrical parameters of the same group in performic acid: C--O = 1.35 Å, O--O = 1.49 Å, O--H = 1.02 Å, $\angle$COO = 105°, $\angle$OOH = 100° (Ref 3). The dihedral angle $\chi$ was taken to be 90°. Assuming the bond lengths and angles just listed and using "spectroscopic masses" of H and D, the authors calculated kinematic coefficients which are given in Table 1 (cols 2 and 4). Six of the eleven non-zero force constants were found by various methods and the remainder were deduced from the constants of $CH_3OH$ (Ref 5) and methyl alcohol; all 21 force constants are given in cols 3 and 6 of Table 1. The calculated and observed vibrational frequencies of COOH and COOD are given below:

Card 2/3

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Characteristic Frequencies of the Hydroperoxide Group C--O--O--H SOV/51-8-1-32/40

| COOH | | | COOD | | |
|---|---|---|---|---|---|
| Bonds, angles | calc. | obs. | bonds, angles | calc. | obs. |
| COO | 586 | 585 | COO | 549 | - |
| $\chi$ | 834 | 840 | $\chi$ | 680 | - |
| O--O | 886 | 880 | O--O | 873 | 855 |
| C--O | 1156 | 1155 | OOD | 997 | 995 |
| OOH | 1321 | 1325 | C--O | 1156 | 1155 |
| O--H | 3450 | 3450 | O--D | 2539 | 2550 |

The 549 and 680 frequencies of COOD were checked using the product rule. The frequencies of the hydroperoxide group vibrations, as well as the reaction energies of hydroperoxide derivatives of benzene, are independent of the nature of the radicals. As pointed out by A.D. Stepukhovich, this means that the electron-shell structure of the COOH or the COOD groups is the same in various hydroperoxides. There are 2 tables, 1 figure and 6 references, 3 of which are Soviet and 3 English.

Card 3/3

SUBMITTED: May 8, 1959.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

Yefimov, A.S.

AUTHOR: Yefimov, A.S. 3-9-17/31

TITLE: University Teaches Bases of Polytechnical Training
(Universitet dayet znaniye osnov politekhnizatsii)

PERIODICAL: Vestnik Vysshey Shkoly, 1957, # 9, pp 69 - 70 (USSR)

ABSTRACT: The author describes experiences at the Uzbek University with regard to the polytechnical training of students.

He mentions two interesting works by K.Z. Zakirov, a regular member of the Uzbek Academy of Sciences (Working Organization of the Chairs of Botany and Zoology in Connection With the Polytechnical Education at Schools) and Senior Teacher A.M. Yusupov (Polytechnical Education in Teaching Electricity).

Polytechnical education at the University is realized by lectures and practical work. The students investigate the scientific bases of industry in theory and practice and obtain the necessary experience. More independent laboratory work is done by the students. For this purpose new laboratories for spectroscopy, electricity, radioactive isotopes, molecular physics, mechanics, radio engineering, heliotechnics, etc. were created.

The plan of physico-mathematics contains new subjects: the principles of mechanical engineering, electrical engineering,

Card 1/2

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radio engineering, motion picture technics. Designing has become more important. The organization of course and diploma work was altered; many students perform their course work at the Kinap factory. During their free time students work in photo-laboratories and automobile-workshops.

The practical training of the biological-geographical faculty was performed in kolkhozes of the Bulungursk and Dzhambaysk districts of Samarkand, where students participated in the cotton harvest, the sorting of cocoons and worked in the botanical garden.

Students of this faculty are enlisted for the investigation and rational utilization of industrial power in the Zeravshan Valley. Industrial excursions are organized as well.

Other students perform their practical training in rural schools where they design training aids.

ASSOCIATION: The Uzbek State University imeni A. Navoi (Uzbekskiy gosudarstvennyy universitet imeni A. Navoi)

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A. S.

Yefimov, A. S.

"Hypnotherapy in Cardiovascular Neuroses and Early Stages of Hypertonic and Coronary Disease." Gor'kiy State Medical Inst imeni S. M. Kirov. Gor'kiy, 1955 (Dissertation for the degree of Candidate in Medical Science)

SO: Knizhnaya letopis' No. 27, 2 July 1955

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S.

GEFTER, A.I., professor; YEFIMOV, A.S.

Hypnotherapy in pain in the cardiac region. Terap.arkh. 27 no.1: 21-28 '55. (MLRA 8:7)

1. Iz kafedry fakul'tetskoy terapii (zav. prof. A.I.Gefter) Gor'-kovskogo meditsinskogo instituta imeni S.M.Kirova.
(ANGINA PECTORIS, therapy,
sleep ther.)
(SLEEP, therapeutic use,
angina pectoris)

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

MIKHEYEVA, I.D. (Moskva), YEFIMOV, A.S., kand.med.nauk (Moskva)

An unusual case of paragonimiasis of the lungs. Sov.med. 22 no.10:119-121 O '58 (MIRA 11:11)

(LUNG DISEASES, case reports
paragonimiasis (Rus))

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S., kand.med.nauk; BEZRUKOV, O.V., ordinator; PRUS, L.Ye., ordinator; YEFIMOVA, Ye.K. (Krasnoyarsk)

Condition of the higher nervous activity in endemic goiter. Probl.endok. i gorm. 5 no.3:43-50 My-Je '59. (MIRA 12:9)

1. Iz kafedry Krasnoyarskogo meditsinskogo instituta (zav. - prof.A.T.Pshonik).

(GOITER, physiol.
endemic, higher nerv. activity (Rus))
(CENTRAL NERVOUS SYSTEM, physiol.
higher nerv. activity in endemic goiter (Rus))

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S., kand.med.nauk (Krasnoyarsk)

Endemic hyperplasia of the thyroid gland of the 1st and 2nd degree as a disease; initial forms of endemic goiter. Probl. endok. i gorm. 5 no.3:113-116 My-Je '59. (MIRA 12:9)
(GOITER, epidemiol.
in Russia, initial forms (Rus))

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S., kand. med. nauk

Scientific session of the Gorkiy Medical Institute on neuro-endocrine pathology. Biul. Uch. med. sov. 3 no.3:35-37 My-Je 1962. (MIRA 17:10)

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S., kand. med. nauk; SANDLER, R.I.; NUFAYEVA, R.A. (Gor'kiy)

"Goiter heart", its pathogenesis, clinical and electrocardiographic characteristics and classification. Probl. endok. i gorm. 9 no.6:64-71 N-D '63.

(MIRA 17:11)

1. Iz kafedry gospital'noy terapii (zav. - prof. V.G. Vogralik) Gor'kovskogo meditsinskogo instituta imeni S.M. Kirova.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S., kand. med. nauk, assistent

Heart and goiter. Sbor. trud. GMI no.15:57-91 '63. (MIRA 17:5)

1. Kafedra gospital'noy terapii lechebnogo fakul'teta Gor'kovskogo meditsinskogo instituta imeni Kirova.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S.; YEFIMOVA, Ye.K.

Effect of local stimulations and destructions of various areas of the reticular formation on the thyroid activity. Fiziol. zhur. 51 no.1:127-133 Ja '65. (MIRA 18:7)

1. Kafedra normal'noy fiziologii i gospital'noy terapii Meditsinskogo instituta imeni Kirova, Gor'kiy.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S.; MOROZOV, N.P.

Results of electrophoretic administration of drugs in the carotid sinus region in treating vascular dystonia. Vop. kur., fizioter. i lech. fiz. kult'. 30 no.3:202-206 My-Je '65. (MIRA 18:12)

1. Kafedra gospital'noy terapii (zav.- prof. V.G. Vorgalik) lechebnogo fakul'teta Gor'kovskogo meditsinskogo instituta. Submitted March 10, 1964.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.S.; MOROZOV, B.A.

Method for eliminating the edge effect in an optically active material on the basis of ED-6 epoxy resin. Zav. lab. 31 no.11: 1389-1390 '65. (MIRA 19:1)

1. Vsesoyuznyy nauchno-issledovatel'skiy i proyektno-konstruktorskiy institut metallurgicheskogo mashinostroyeniya.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

PROTASENYA, Tit Petrovich, doktor veterinarnykh nauk, professor; MARAYEV, P.V., dotsent [deceased]; YEFIMOV, A.V., redaktor; BALLOD, A.I., tekhnicheskiy redaktor

[Pathological physiology and pathological anatomy] Patologicheskaia fiziologiia i patologicheskaia anatomiia. Izd. 5-oe, ispr. i perer. Moskva, Gos. izd-vo selkhoz. lit-ry, 1956. 384 p. (MLRA 10:1)
(Veterinary pathology)

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

EFIMOV, ALEKSEI VLADIMIROVICH

EFIMOV, ALEKSEI VLADIMIROVICH. Iz istorii ruskikh ekspeditsii na Tikhom okeane. [Moskva, Voen. izd-vo, 1948] "Dokumenty": v. 1, p. [211-296] Bibliographical footnotes. Contents. -Pt. 1. Pervaia polovina XVIII veka. *NNC DLC: G292.E5*

SO: LC, Soviet Geography, Part I, 1951, Uncl.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A. V.

Yefimov, A. V. - "Famous Russian geographical discoveries," (In the XVII and first half of the XVIII century), Prepodavaniye istorii v shkole, 1949, No. 2, p. 28-42

SO: U-5240, 17, Dec. 53, (Letopis 'Zhurnal 'nykh Statey, No. 25, 1949).

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A. V.

"Discoveries of 18th Century Russian Land and Arctic Sea Explorers in Northeast Asia," Iz. Ak Nauk SSSR, Ser. geog., No.4, 1952

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.

24b-67. **Failures of Seagoing Ship Propeller Shafts.** (In Russian.) A. V. Efimov. *Collection of Reports Concerning the Dynamic Strength of Machine Parts*, Academy of Sciences of the U.S.S.R., 1946, p. 220-224.

Specific operating conditions and main factors responsible for failures which are said to be quite different from those involved in stationary-engine operation. Suggestions for preventing failures.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.

Improving collections of articles on the exchange of technical experience. Tekst.prom. 14 no.6:54 Je '54. (MLRA 7:7)
(Textile machinery)

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A. V.

AUTHOR: Yefimov, A.V., Engineer. 114-8-5/16

TITLE: Mastery of new processes of welding parts and assemblies of gas turbine installations in the 'Ekonomayzer' works. (Osvoyeniye novykh protsessov svarki detaley i uzlov gazoturbinnoy ustanovki na zavode "Ekonomayzer")

PERIODICAL: "Energomashinostroyeniye" (Power Machinery Construction), 1957, Vol.3, No.8, p. 19 (U.S.S.R.)

ABSTRACT: Very brief notes are given on the following: the welding of the generator parts made of steel 1X18H9T 0.5 mm thick using argon-arc welding; the use of an ordinary turning lathe to weld the rotor of a gas turbine installation made of steel ЭИ-415 and also the equipment of three lathes for cutting complicated profiles.

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

AUTHOR: Yefimov, A.V., Engineer SOV-117-58-4-15/21

TITLE: Work Methods of Innovator Lathe-Operator F.I. Dikiy (Metody raboty tokarya-novatora F.I. Dikogo)

PERIODICAL: Mashinostroitel', 1958, Nr 4, pp 37-38 (USSR)

ABSTRACT: Several practical ideas introduced by lathe operator F.I. Dikiy of the plant "Ekonomayzer" are described: 1) special cutters for machining rubber-lined brass bearings(Figure 1); 2) spindle mandrel (Figure 5) and a special attachment (Figure 6) for machining textolite rings on a lathe; 3) a multi-edge cutter (Fig. 8) for simultaneous cutting on several surfaces of a flanged bushing (Figure 7). There are 8 drawings.

1. Lather--Operation 2. Lather--Equipment 3. Personnel--Performance

Card 1/1

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V., inzh.

New machine at the "Ekonomaizer" plant. Energomashinostroenie 4 no.1: 40 Ja '58. (MIRA 11:1)

(Balancing of machinery)

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24(6) PHASE I BOOK EXPLOITATION SOV/2385

Akademiya nauk SSSR

Nekotoryye problemy prochnosti tverdogo tela; sbornik statey (Some Problems in the Strength of Solids; Collection of Articles) Moscow, Izd-vo AN SSSR, 1959. 386 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V. I. Aver'yanov; Tech. Ed.: R. S. Pevzner; Editorial Board: A.F. Ioffe, Academician; G. V. Kurdyumov, Academician; S. N. Zhurkov, Corresponding Member, USSR Academy of Sciences; B. P. Konstantinov, Corresponding Member, USSR Academy of Sciences; F. F. Vitman, Doctor of Physical and Mathematical Sciences, Professor (Resp. Ed.); L. A. Glikman, Doctor of Technical Sciences, Professor; N. A. Zlatin, Doctor of Physical and Mathematical Sciences; V. A. Stepanov, Doctor of Technical Sciences; Ya.B. Fridman, Doctor of Technical Sciences, Professor; B. S. Ioffe, Candidate of Technical Sciences (Deputy Resp. Ed.).

PURPOSE: This book is intended for construction engineers, technologists, physicists and other persons interested in the strength of materials.

COVERAGE: This collection of articles was compiled by the Otdeleniye fiziko-matematicheskikh nauk AN SSSR (Department of Physical and Mathematical Sciences) and the Fiziko-tekhnicheskiy institut AN SSSR (Institute of Applied Physics, Academy of Sciences, USSR) in commemoration of the 80th birthday of Nikolay Nikolayevich Davidenkov, Member of the Ukranian Academy of Sciences, founder and head of the Otdel prochnosti materialov (Department of the Strength of Materials) at the Institute of Applied Physics, Academy of Sciences, USSR, founder of the Fakul'tet fizicheskogo metallovedeniya (Department of Physical Metallurgy) at the Leningradskiy politekhnicheskiy institut (Leningrad Polytechnic Institute), recipient of the Stalin Prize (1943), the Order of the Red Banner of Labor (1945) and the Order of Lenin (1953). The articles deal with the strength of materials, phenomena of imperfect elasticity, temper brittleness, hydrogen embrittlement, cold brittleness, influence of deformation speed on the mechanical properties of materials, fatigue of metals, and general problems of the strength, plasticity, and mechanical properties of nonmetals. Numerous personalities are mentioned in the introductory profile of Professor Davidenkov. References are given at the end of each article.


Moroz, L.S., and Yu.D. Khesin. Investigation of the Hydrogen Embrittlement of Two-Phase Titanium Alloys 140

Potak, Ya.M., and G.P. Breslavtseva. Hydrogen Embrittlement of Steel and the Influence of Mechanical Testing Conditions on Its Occurrence 152

Sokolkov, Ye.N., V.D. Sadovskiy, and S.N. Petrova (Institute for Metal Physics, Ural Branch, Academy of Sciences, USSR, Sverdlovsk) Structure of Austenite Grain Boundaries and the Temper Brittleness of Structural Steel 165

Agayev, N.V., and V.A. Trapeznikov (Institut metallurgii AN SSSR, g. Moskva - Metallurgical Institute, Academy of Sciences, USSR, Moscow). Influence of the Degree of Purity on Cold Brittleness and Other Properties of Chromium 172

Martov, V.G., F.G. Rashkov, and Ye.D. Teplova. Cold Hardening of Pearlitic Steel With an External Layer of Austenitic Steel Alloy 179

Sakharov, P.S. (Industrial'nyy institut imeni Kuybysheva, g. Kuybyshev - Industrial Institute imeni Kuybyshev, Kuybyshev). Effect of the Cooling Rate and Some Other Factors on Rupture Strength of Chromium-Aluminum Steel 187

Shevandin, Ye.M. (deceased), I.A. Razov, and A.V. Yeflaov. Influence of the Scale Factor During Plastic Deformation and Rupture of Steels of Varying Strength 194

Vitman, F.F., and V.A. Stepanov (Institute of Applied Physics, Academy of Sciences, USSR, Leningrad). Influence of Deformation Rate on the Deformation Resistance of Metals at Impact Speeds of $10^{2}$ - $10^{3}$ m/sec 207

Zlatin, N.A. (Institute of Applied Physics, Academy of Sciences, USSR, Leningrad) Role of Compressibility in the Dynamic Deformation of Plastic Bodies 222

Konstantinov, V.N., and Ye.I. Timofeyev. Influence of a High Deformation Rate on the Mechanical Properties of Steel Alloy Type V-95 After Varying Degrees of Aging 230

Ushik, G.V., and Yu.Ya. Voloshenk-Klimovitskiy (Institute of Mechanical Engineering, Academy of Sciences, USSR, Moscow) Resistance to Initial Plastic Deformation During Impact Stress Under Low-temperature Conditions 238

Glikman, L.A., and V.P. Tekht. Physical Nature of Metal Fatigue. 246

Kudryavtsev, I.V., and N.M. Savvina (TsNIITMASh - Central Scientific Research Institute of Technology and Machinery). Fatigue Strength of Large Plates 256


Card 7/10

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

25(7) SOV/117-59-3-15/37

AUTHOR: Yefimov, A.V., Engineer

TITLE: The Manufacturing of Sieves for Steam Turbines (Izgotovleniye sit k parovym turbinam)

PERIODICAL: Mashinostroitel', 1959, Nr 3, pp 23 - 24 (USSR)

ABSTRACT: Detailed design and operational information is given on a new punching die for manufacturing the air distributor sieves of steam turbines. The die replaces the drilling method that required over 3 hours for a sieve with 966 holes, and a large number of drills. The plant uses only two sizes of die for all steam turbines being produced - one with 19 punches, and the other with 26, each die including two knives. Punching all holes on a steel plate of 74 mm diameter and 1,000 mm length requires 189 work strokes of the press. Broken punches are readily replaceable. There is one diagram.

Card 1/1

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S/137/60/000/009/012/029
A006/A001

Translation from: Referativnyy zhurnal, Metallurgiya, 1960, No. 9, p. 236, # 21413

AUTHORS: Shevandin, Ye.M., Razov, I.A., Yefimov, A.V.

TITLE: Investigation of the Scale Effect During Plastic Deformation and Failure on Steels of Various Strength

PERIODICAL: V sb.: Nekotoryye probl. prochnosti tverdogo tela, Moscow-Leningrad, AN SSSR, 1959, pp. 194-206

TEXT: It is shown that the deformation, $\delta$ in. corresponding to the appearance of the first cracks of 0.2-0.3 mm size, does not depend on the scale of specimens. The scale effect consists in the considerable reduction of the ultimate deformation corresponding to complete failure $\delta$ fin. This is explained by an increase of energy stored in the loaded system at a larger size of the specimens. A zone that is strongly affected by the scale factor appears at a

Card 1/2

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

S/137/60/000/009/012/020
A006/A001

Investigation of the Scale Effect During Plastic Deformation and Failure on Steels of Various Strength

relatively small size of high-strength steels. Reduced yielding of the testing machine causes an increase of $\delta_{fin}$, which also indicates the energy nature of the scale factor. There are 19 references.
(Abstractor's note: Subscripts "in" and "fin" are translations from the original n = nachal'noye (initial) and k = konechnoye (final).

I.K.

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

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SOV/126-8-6-22/24

AUTHORS: Razov, I.A., Shevandin, Ye.M. and Yefimov, A.V.

TITLE: Influence of Size Effect on the Deformability of Metals

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 6, pp 928-933 (USSR)

ABSTRACT: An investigation was carried out with specimens of SKhL-4 steel of the following dimensions: 20 x 20 x 110 mm with a notch base radius of $\varphi = 6$ mm and 5 x 5 x 27.5 mm with a notch base diameter of $\varphi = 1.5$ mm. The small specimens were cut out from the halves of large specimens after the latter had been tested. The position of the notch of the small specimen always coincided with that of the large one. Thus, the maximum possible material uniformity was ensured for specimens of both dimensions which were subjected to plastic deformation and fracture. This enabled the physical size effect to be investigated and any possible influence of the technological factor to be practically entirely excluded. The specimens were tested in static bending by a concentrated force applied at the centre of the span. In all specimens the percentage deformation at which macro-cracks of approximately 0.2 to 0.3 mm in dimension made their first

Card 1/3

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SOV/126-8-6-22/24

Influence of Size Effect on the Deformability of Metals

appearance was determined, as well as the deformation at which complete failure occurred, ie at which fracture cracks appeared along the whole length of the notch base. The method by which the deformation was determined in the testing of the large specimens was the same as described by Shevandin et al (Ref 13). A somewhat different method was used in the testing of the small specimens. The latter consisted in applying to the surface of the notch base a few "points" with a tyre dye. The size of the "points" chosen was 0.3 to 0.5 mm, depending on the radius of the notch base. The point sizes before and during testing were measured with the instrument microscope UIM-21[38] with an accuracy of up to 0.001 mm. To each specimen 3 - 4 "points" were applied in the central of its 3 portions. The average of all measurements was taken as the result. The results obtained for all the specimens are shown in the table, p 929. From these results frequency curves of deformation, corresponding to the first appearance of cracks and to complete failure, have been constructed (Fig 1 and 2). Fig 3 shows the schematic disposition of curves for the

Card 2/3

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SOV/126-8-6-22/24

Influence of Size Effect on the Deformability of Metals

distribution of deformation at which failure is initiated: a - at the Gauss and b - at the hyperbolic law of defect distribution. (1 - large specimens; 2 - small specimens). The authors conclude that the size effect as a whole is a manifestation of energetic and static factors. The former plays the main and the latter the subsidiary role, determining the position and nature, respectively, of the distribution curve. The so-called metallurgical factor which is responsible for the inhomogeneity of metals is also of particular importance, especially in steel, in connection with the technology of its manufacture, namely, the particular methods of casting, rolling etc. There are 3 figures, 1 table and 15 references, 13 of which are Soviet, 1 Swedish and 1 English.

ASSOCIATION: Tsentral'nyy nauchno-issledovatel'skiy institut im A.N.Krylova (Central Scientific Research Institute imeni A.N.Krylov)

SUBMITTED: February 24, 1959

Card 3/3

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.

Need for more efficient textile machinery designs. Tekst.prom. 20 no.10:73-74 O'60. (MIRA 13:11)

1. Nachal'nik remontno-montazhnogo otdela Dreznenskoy fabriki. (Textile industry)

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20196

2808
1418, 1573

10.9230

S/032/61/027/003/016/025
B101/B203

AUTHORS: Razov, I. A., Aleksandrov, S. I., and Yefimov, A. V.

TITLE: Character of the size effect

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 3, 1961, 323-326

TEXT: The authors mention the explanation of the size effect on the basis of the statistical distribution of defects in the material, and on the basis of the energetic theory which explains the size effect by the influence exerted by the elasticity energy accumulated in the loaded system on the destruction process. In a previous paper, they studied the influence of the elasticity energy on the limit of plasticity at the beginning and the end of destruction of specimens of different sizes. The results given in Fig. 1 confirm the energetic explanation of the size effect. The statistical factor, however, also plays a certain role. The following experiments were made to confirm the energetic theory: Flat specimens with the cross section 6 • 250 mm, length 1.5 - 4 m, were provided with a central notch, and subjected to a tensile test. Fig. 2 shows that the tension (σ), which corresponds to the formation of the

Card 1/5

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Character of the size effect

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primary crack in the notch, does not depend on the length of specimen. On the other hand, the tension (x) required for a complete destruction of the specimen decreases with the length of specimen. The experiments were made with AMg5B (AMg5V) alloy. Similar results were obtained with steel. Contrary to statements by Ya. B. Fridman and T. A. Volodina (Ref. 7: Doklady AN SSSR, v. 55, 8, 721 (1947)), the high sensitiveness of highly solid alloys to notches observed by these researchers is explained by the high absolute temporary resistance and the high stock of potential energy of the loaded system. [Abstracter's note: The statements made by Fridman and Volodina are not given.] Further, the authors discuss data found by I. M. Roytman and Ya. B. Fridman (Ref. 8: Mikromekhanicheskiy metod ispytaniya metallov, M., Oborongiz (1950)) for the dependence of temporary resistance and real resistance on size on the basis of the energetic theory, and explain the data found by B. B. Chechulin (Ref. 9: Sb. "Metallovedeniye", 3, Sudpromgiz, 158, (1959)), which contradict the energetic theory, with experimental errors. In conclusion, it is stated that the energetic factor of the size effect plays the major part, whereas the statistical factor plays an inferior part. The following is suggested to determine the sensitiveness of

Card 2/5

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Character of the size effect

material to the size effect: bending test of specimens 5 · 5 · 27.5 mm and 20 · 20 · 110 mm, notch Q of 1.5 and 6 mm, respectively, and comparison of the limit of plasticity, of the deformation curve in tough fracture, or of the strength in brittle fracture. Ye. M. Shevandin, I. L. Shimelevich, V. V. Lavrov, G. M. Bartenev, and L. P. Tsepkov are mentioned. There are 3 figures and 11 references: 9 Soviet-bloc and 2 non-Soviet-bloc.

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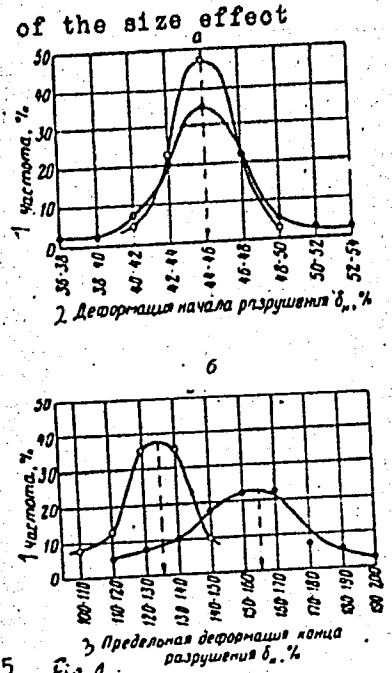
Character of the size effect




Legend to Fig. 1: Distribution curves of deformation at the beginning of destruction (a) and at the end of destruction (б); o specimen 20 · 20 · 100 mm, ϱ = 6 mm; • 5 · 5 · 27.5 mm, ϱ = 1.5 mm. 1) Frequency, 2) deformation at the beginning of destruction, 3) limit deformation at the end of destruction.

Card 4/5 Fig. 1

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Character of the size effect

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Legend to Fig. 2: a) Form of specimen, б) test results ; o beginning of cracking; X complete destruction; 1) length of plates, m; 2) mean stress in the notched cross section as a fraction of the yield strength.

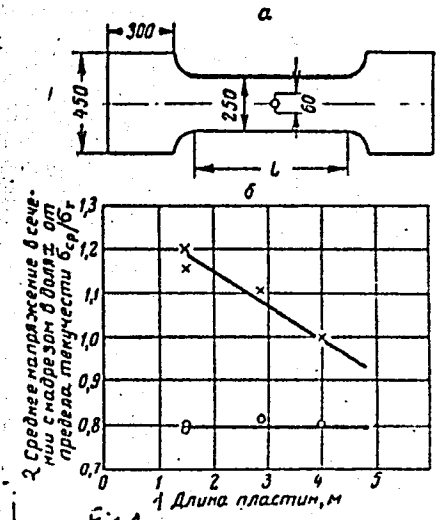


Fig. 2

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SEVOST'YANOV, Aleksey Grigor'yevich; YEFIMOV, Aleksey Vasil'yevich; GONCHAROV, A.V., retsenzent; DUKHOVNYY, F.N., red.

[Design, assembly, repair and adjustment of drawing and roving machines] Ustroistvo, montazh, remont i naladka lentoochnykh i rovnichnykh mashin. Moskva, Izd-vo "Legkaia industriia," 1964. 317 p. (MIRA 17:5)

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L 9235-66 EWT(m)/EWP(w)/EPF(n)-2/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(z)/EWP(b)/EWA(h)/EWA(c) MJW/JD/HM/GG/GS

ACC NR: AT5023783 SOURCE CODE: UR/0000/62/000/000/0058/0067

AUTHOR: Amayev, A. D.; Yefimov, A. V.; Platonov, P. A.; Pravdyuk, N. F.; Razov, I.A.; Khlebnikov, A. M.

ORG: none

TITLE: Effect of neutron irradiation on the mechanical properties of heat-resistant ferritic-pearlitic steels and on their welded joints

SOURCE: Soveshchaniye po probleme Deystviye yadernykh izlucheniy na materialy. Moscow, 1960. Deystviye yadernykh izlucheniy na materialy (The effect of nuclear radiation on materials); doklady soveschaniya. Moscow, Izd-vo AN SSSR, 1962, 58-67

TOPIC TAGS: ferritic pearlitic steel, neutron irradiation, steel irradiation, steel property, weld property/25Kh2MFA steel, 12Kh2MFA steel

ABSTRACT: The effect of neutron irradiation on the mechanical properties of ferritic-pearlitic steels and their welded joints has been investigated. Specimens of annealed and tempered 25Kh2MFA and 12Kh2MFA chromium-molybdenum-vanadium steels with 0.2% and 0.1% C, respectively, were irradiated at 80—305C with integrated neutron fluxes of $2.8 \times 10^{17}$—$7.2 \times 10^{19}$ n/cm$^2$ (35% of neutrons with energy > 1). Mechanical tests of both steels and of 12Kh2MFA steel welds showed that neutron irradiation increases strength and decreases ductility and notch toughness, but not as much as in 25KhNM steel or 20 steel irradiated under the same conditions. This shows that metal strengthened by means of alloying or heat treatment, plastic

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deformation or dispersion hardening is less sensitive to irradiation. The mechanical properties of 12Kh2MFA steel welds obtained by manual or automatic welding with 12KhMF or 12KhM electrode wires undergo practically the same change as the base metal when irradiated with a $7 \cdot 10^{19}$ n/cm$^2$ flux. However, this change is slightly more pronounced in welds obtained with 12KhM wire, owing to its lower content of alloying elements. Increasing the temperature of irradiation decreased the radiation damage in all tested steels and diminished the degree of change in mechanical properties, because the damage is partially or completely eliminated by annealing. The highest temperatures at which no change of mechanical properties of ferritic-pearlitic steels and their welds occurs under effect of irradiation with neutron flux of the indicated intensity are 350—400C. At an irradiation temperature of 100C, none of the tested steels attains the highest values of strength, ductility, and toughness, unless the flux of fast neutrons is $10^{20}$ n/cm$^2$. Orig. art. has: 9 figures and 4 tables.

[ND]

SUB CODE: 11, 20/ SUBM DATE: 18Aug62/ ORIG REF: 003

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L 10800-66 EWT(m)/EWP(w)/EPF(n)-2/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/EWA(h) IJP(c)

ACC NR: AT5023784 MJW/JD/JG/GG/GS SOURCE CODE: UR/0000/62/000/000/0068/0073

AUTHOR: Yefimov, A. V.; Kozhevnikov, O. A.; Nikolayev, V. A.; Pravdyuk, N. F.; Razov, I. A.; Khlebrikov, A. M.

ORG: none

TITLE: Effect of neutron irradiation on the mechanical properties of stainless austenitic steels of various strength

SOURCE: Soveshchaniye po probleme Deystviye yadernykh izlucheniy na materialy. Moscow, 1960. (Deystviye yadernykh izlucheniy na materialy (The effect of nuclear radiation on materials); doklady soveshchaniya. Moscow, Izd-vo AN SSSR, 1962. 68-73

TOPIC TAGS: austenitic steel, austenitic alloy steel, neutron irradiation, steel irradiation, steel property

ABSTRACT: The effect of neutron irradiation on the mechanical properties of stainless austenitic steels has been investigated. 1Kh18N9T steel austenitized at 1000C or austenitized at this temperature and cold rolled with 25% elongation, and austenitic, dispersion-hardenable, chromium-nickel steel of the 18-22 type, alloyed with tungsten and titanium, were irradiated with integrated fluxes of $7.4 \times 10^{20}$ or $2 \times 10^{20}$ n/cm$^2$ with energy > 1Mev at 100C, 300C, or 500C. Tests showed that irradiation of as-austenitized 1Kh18N9T steel at 100C with $7.4 \times 10^{19}$ n/cm$^2$ increases the yield and tensile strengths by 101% and 24%, respectively, and decreases the elongation and

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ACC NR: AT5023784

notch toughness by 39% and 20%. The same irradiation increases the yield and tensile strengths of austenitized and cold-rolled 1Kh18N9T steel only by 27% and 21%, and decreases its elongation and notch toughness by 38% and 42%. Increasing the irradiation intensity from $7.4 \times 10^{19}$ to $2.10^{20}$ n/cm$^2$ has no effect on the properties of this steel. Increasing the temperature of irradiation with $7.4 \times 10^{19}$ n/cm$^2$ from 100 to 300 to 500C decreases the yield strength of austenitized and cold-rolled steel by 11% and 30% below that of steel irradiated at 100C. The tensile strength drops in this case by 4 and 17%, but the elongation increases by 44 and 148%. The mechanical properties of stainless chromium-nickel steel alloyed with tungsten and titanium and austenitized and aged at 710C for 10 hours, do not change much under the effect of fast-neutron irradiation at $2\ 10^{20}$ n/cm$^2$, except for the yield strength, which increases by 30%. Orig. art. has: 4 figures and 2 tables. [ND]

SUB CODE: 13, 20 SUBM DATE: 18Aug62/ ORIG REF: 003/ OTH REF: 008

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APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.,; BELOV, M.I., doktor ist. nauk; MEDUSHEVSKAYA, O.M., kand. ist. nauk;

[Atlas of geographical discoveries in Siberia and northwestern America in the 17th and 18th centuries] Atlas geograficheskikh otkrytii v Sibiri i v Severo-Zapadnoi Amerike XVII-XVIII vv. Moskva, Nauka, 1964. 134 p. (MIRA 17:9)

1. Chlen-korrespondent AN SSSR (for Yefimov).

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

GOL'DENBERG, Leonid Arkad'yevich; YEFIMOV, A.V., otv. red.

[Semen Ul'ianovich Remezov, Siberian cartographer and geographer; 1642-after 1720] Semen Ul'ianovich Remezov, sibirskii kartograf i geograf (1642-1720 gg.) Moskva, Nauka, 1965. 262 p. (MIRA 18:8)

1. Chlen-korrespondent AN SSSR (for Yefimov).

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A. V., Cand Phys-Math Sci -- (diss) "On the approximation of certain classes of continuous functions with Fourier and Fayer sums." Moscow, 1957. 7 pp (Acad Sci USSR. Mathematics Institute im V. A. Steklov), (KL, 36-57, 103)

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.

YEFIMOV, A.V.

Fourier's coefficients of functions of the class $\tilde{H}_2^1$. Usp.mat.nauk 12 no.3:303-311 My-Je '57. (MIRA 10:10)
(Functional analysis)

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.

SUBJECT USSR/MATHEMATICS/Theory of functions CARD 1/1 PG - 912

AUTHOR EFIMOV A.V.

TITLE Estimation of the modulus of continuity of functions of the class $\tilde{H}_2^1$.

PERIODICAL Izvestija Akad.Nauk 21, 283-288 (1957)
reviewed 7/1957

Let $H_2^1(M)$ be the class of continuous functions $f(x)$ which are periodic with the period $2\pi$ and for all $x$ and $h>0$ satisfy the condition

$$|f(x+h)-2f(x)+f(x-h)| \leq Mh.$$

Let $\omega(h,f)$ be the modulus of continuity of $f(x)$.

Theorem:

$$\omega(h) = \sup_{f \in \tilde{H}_2^1(1)} \omega(h,f) = \frac{1}{2 \ln (\sqrt{2}+1)} h \ln \frac{1}{h} + O(h).$$

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YEFIMOV, A.V.

20-5-4/60

AUTHOR YEFIMOV, A.V.

TITLE Approximation of Certain Classes of Continous functions by means of Fourier and Féjer Sums.- (O priblizhenii nekotcrykh klassov nepreryvnykh funktsiy summami Fur'ye i summami Feyera.- Russian)

PERIODICAL Doklady Akademii Nauk SSSR 1957, Vol 114, Nr 5, pp 930-933 (USSR)

ABSTRACT Let $\mathfrak{m}$ here be assumed to be a certain class of steady functions and $U_n$ a linear operator (approximation method), which brings a certain polynomial of the order n (the value of which is denoted at the point x by $U_n(f,x)$) into agreement with every function f t $\mathfrak{m}$. The author here investigates the following two problems:

I. To find the principal term of the deviation of the function f(x) from $U_n f,x)$ with a remaining term, which is uniform with respect to the entire class $\mathfrak{m}$ i.e. the representation

$$f(x)-U_n(f,x) = A_{U_n}(f,x) + O(B_{U_n}(\mathfrak{m}))$$ is to be ascertained.

CARD 1/2 II. Investigation of the behavior of the upper limit

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Approximation of Certain Classes of Continuousfunctions by means of Fourier and Féjer Sums.

$$E_{U_n}(\mathfrak{M}) = \sup_{f \in \mathfrak{M}} \| f(x) - U_n(f,x) \| = \sup_{f \in \mathfrak{M}} \max_x | f(x) - U_n(f,x) |$$

i.e. of the upper limit of the deviations of the function $f(x)$ from $U_n(f,x)$. On this occasion the function $f(x)$ was extended to the entire class $\mathfrak{M}$.
In some cases the solution of problem I makes the asymptotically accurate solution of problem II possible. The author here defines some classes of steady functions with the period $2\pi$. Next, some definitions and 7 theorems are given.
(No Illustrations)

ASSOCIATION: Mathematical Institute "V.A. STEKLOV" of the Academy of science of the USSR.
(Matematicheskiy institut im V.A. STEKLOVA Akademii nauk SSSR)

PRESENTED BY: M.A. Lavrent'yev, member of the Academy, 4.1.1957
SUBMITTED: 3.1.1957
AVAILABLE: Library of Congress.

CARD 2/2

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.

38-22-1-4/6

AUTHOR: Yefimov, A.V.

TITLE: On the Approximation of Certain Classes of Continuous Functions by Fourier and Feyer Sums (O pribliżhenii nekotorykh klassov nepreryvnykh funktsiy summami Fur'ye i summami Feyyera)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, 1958, Vol 22, pp 81-116 (USSR)

ABSTRACT: Let $\mathfrak{M}$ be a class of continuous functions and $U_n$ a linear operator which makes correspond to each $f(x) \in \mathfrak{M}$ a polynomial of n-th degree the value of which in the point x is denoted by $U_n(f,x)$. The author considers two problems:

I. The main term of the deviation of the function $f(x) \in \mathfrak{M}$ from $U_n(f,x)$ is to be determined with a remaining term which is uniform with regard to the entire class $\mathfrak{M}$.

II. The behavior of the upper bound

$$E_{U_n}(\mathfrak{M}) = \sup_{f \in \mathfrak{M}} \| f(x) - U_n(f,x) \| = \sup_{f \in \mathfrak{M}} \max_x |f(x) - U_n(f,x)|$$

is to be investigated. Both problems are investigated in the following cases:

Card 1/6

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On the Approximation of Certain Classes of Continuous Functions by Fourier and Feyer Sums 38-22-1-4/6

1. $U_n(f,x) = S_n(f,x) = \frac{a_0}{2} + \sum_{k=1}^{n} (a_k \cos kx + b_k \sin kx)$ $(n=0,1,..)$

2. $U_n(f,x) = \sigma_n(f,x) = \frac{1}{n+1} \sum_{k=0}^{n} S_k(f,x)$

Here the following continuous $2\pi$-periodic function classes are considered:

1. $f(x) \in MW^r H_1^\alpha$, if $|f^{(r)}(x)| \leqslant M$, $|f^{(r)}(x+h) - f^{(r)}(x)| \leqslant M|h|^\alpha$, $0 \leqslant \alpha \leqslant 1$ 2. $MH_1^\alpha \equiv MW^0 H_1^\alpha$ 3. $f(x) \in MW^r H_2^\alpha$, if $|f^{(r)}(x)| \leqslant M$ and $|f^{(r)}(x+h) - 2f^{(r)}(x) + f^{(r)}(x-h)| \leqslant M|h|^\alpha$, $0 < \alpha \leqslant 1$ 4. $MH_2^\alpha \equiv$ $\equiv MW^0 H_2^\alpha$ 5. $f(x) \in MW_\beta^r$, if $|\varphi(x)| \leqslant M$, $\int_{-\pi}^{\pi} \varphi(x)dx = 0$ and

Card 2/6

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$$f(x) = \frac{1}{\pi}\int_{-\pi}^{\pi} \varphi(x+t) \sum_{k=1}^{\infty} \frac{\cos(kt+\frac{\beta\pi}{2})}{k^r}\, dt$$

6. Analogous definition of $f(x) \in MW_\beta^r H_2^\alpha$. As an nonperiodic class it is considered: $f(x) \in MH_2^\alpha(a,b)$, if $f(x)$ is continuous on $[a,b]$ and if for all $x \pm h \in [a,b]$ it holds: $|f(x+h)-2f(x) + f(x-h)| \leqslant M|h|^\alpha$, $0 < \alpha \leqslant 1$.

Main results:

1. If $\omega_2(h,f) = \sup_{|\delta|\leqslant h} \| f(x+\delta)-2f(x)+f(x-\delta)\|$ is the modulus of smoothness of the $2\pi$-periodic function $f(x)$, then it is

$$f(x)-\sigma_{n-1}(f,x) = -\frac{1}{2\pi}\int_a^{\infty} \frac{f(x+\frac{2t}{n})-2f(x)+f(x-\frac{2t}{n})}{t^2}\, dt + O(\omega_\lambda(\tfrac{1}{n},f))$$

Card 3/6

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where $a > 0$ is an arbitrary constant.

2. If $f(x) \in H_2'$ and $\bar{f}(x)$ is the conjugate function, then it is

$$\bar{f}(x) - \bar{\sigma}_{n-1}(f,x) = -\frac{1}{n}\int_0^{a_1}\left[f\left(x+\frac{t}{n}\right) - f\left(x-\frac{t}{n}\right)\right]\frac{\sin t}{t^2}\,dt + O\left(\frac{1}{n}\right)$$

where $a_1$ is the smallest root of the equation $\int_0^n \frac{\sin t}{t}\,dt = \frac{\pi}{2}$.

Furthermore it is:

$$E\sigma_n(\bar{H}_2') = \frac{1}{2\ln(\sqrt{2}+1)}\,\frac{\ln n}{n} + O\left(\frac{1}{n}\right)$$

3. If $f(x) \in W_\beta^r H_2^\alpha$, then it is

$$R_n(f,x) = \frac{1}{(n+1)^r}\, r_{n,\beta}(\varphi,x) + O\left(\frac{1}{n^{r+\alpha}}\right)$$ whereby $R_n$ is the remainder of the Fourier series for $f(x) \in W_\beta^r H_2^\alpha$.



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and $r_{n,\beta}$ is the remainder of the Fourier series for $f(x) \in W_\beta^0 H_2^\alpha$.

4. For $f(x) \in W_\beta^0 H_2^\alpha$, $0 < \alpha \leq 1$ an explicit, very long expression for $r_{n,\beta}$ is given.

5. If it is put

$$C_2(\alpha) = \sup_{f \in H_2^\alpha} |a_1(f)| = \sup_{f \in H_2^\alpha} \left| \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos x \, dx \right|$$ then it is

$$E_{S_n}(W_\beta^0 H_2^\alpha) = \frac{C_2(\alpha)}{\pi} \frac{\ln n}{n^\alpha} + 0\left(\frac{\ln \ln n}{n^\alpha}\right), \quad 0 < \alpha \leq 1 \text{ and}$$

$$E_{S_n}(W_\beta^r H_2^\alpha) = \frac{C_2(\alpha)}{\pi} \frac{\ln n}{n^{r+\alpha}} + 0\left(\frac{\ln \ln n}{n^{r+\alpha}}\right), \quad r > 0, \quad 0 < \alpha \leq 1$$



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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

On the Approximation of Certain Classes of Continuous Functions by Fourier and Feyer Sums 38-22-1-4/6

The author obtained the theme of the present investigation from S.B. Stechkin. There are 28 references, 20 of which are Soviet, 1 Hungarian, 2 French, 4 American, and 1 English.

PRESENTED: by M.A. Lavrent'yev, Academician

SUBMITTED: January 2, 1957

AVAILABLE: Library of Congress

1. Functions-Analysis 2. Fouriers series-Application

Card 6/6

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

16(1) SOV/42-14-1-13/27

AUTHOR: Yefimov, A. V.

TITLE: Approximation of Conjugate Functions by Feyer Sums (Priblizheniye sopryazhennykh funktsiy summami Feyera)

PERIODICAL: Uspekhi matematicheskikh nauk, 1959, Vol 14, Nr 1, pp 183-188 (USSR)

ABSTRACT: Let $f(x)$ be a continuous $2\pi$-periodic function, $a_m$, $b_m$ its Fourier coefficients, $S_n(f,x)$ its Fourier partial sums, $\sigma_n(f,x)$, its Feyer sums. Let $f(x) \in MH_k'$ if $f(x)$ is $2\pi$-periodic and for all $x \in [0, 2\pi]$ and $h > 0$ it holds: $\omega_k(h,f) = \sup_{|\delta| \leq h} \|\Delta_\delta^k f(x)\| = \sup_{|\delta| \leq h} \max_x \left| \sum_{i=0}^{k} (-1)^{k-i} \binom{k}{i} f(x + \overline{k-2i}\, \frac{\delta}{2}) \right| \leq Mh$, $k \geq 1$, integral. Let $\bar{f}(x)$ be the function conjugate to $f(x)$.

Theorem: If $f(x) \in H_k'$, $k \geq 2$, then

$$\bar{f}(x) - \bar{\sigma}_{n-1}(f,x) = f(x - \frac{1}{2n}) - f(x + \frac{1}{2n}) + O(\frac{1}{n}).$$

Card 1/2

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Approximation of Conjugate Functions by Feyer Sums 307/42-14-1-13/27

Let $\varphi(x) \in M\tilde{H}_k'$, if $\varphi(x) = f(x) + ax + b$, where $f(x) \in MH_k'$.

Theorem: Let $f(x) \in \tilde{H}_k'$, $f(0) = 0$, $z > y > 0$. Then

$$\frac{1}{y} f(y) - \frac{1}{z} f(z) = O(1 + \ln \frac{z}{y}).$$

Theorem: Let $f(x) \in \tilde{H}_2'$, $f(0) = 0$, $z > y > 0$. Then

$$\sup_{\substack{f \in \tilde{H}_2' \\ f(0)=0}} \left| \frac{1}{y} f(y) - \frac{1}{z} f(z) \right| = \frac{1}{2\ln(\sqrt{2}+1)} \ln \frac{z}{y} + O(1).$$

There are 7 references, 6 of which are Soviet, and 1 Hungarian.

SUBMITTED: December 21, 1957

Card 2/2

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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5

16(1) SOV/38-23-1-5/6

AUTHOR: Yefimov, A.V.

TITLE: ~~Approximation~~ by Fourier Sums of Functions With a Given Modulus of Continuity (Priblizheniye funktsiy s zadannym modulem nepreryvnosti summami Fur'ye)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1959, Vol 23, Nr 1, pp 115-134 (USSR)

ABSTRACT: For functions with a given modulus of smoothness $\omega_2(\delta, f) = \sup_{|h| \leq \delta} \max_x f(x+h) - 2f(x) + f(x-h)$ the deviation of the function from its Fourier sums is estimated from above. For functions with a given majorant of the modulus of continuity the author gives an asymptotically exact estimation of the above mentioned deviation. The author mentions papers of A.N. Kolmogorov and S.M. Nikol'skiy. He thanks S.B. Stechkin for giving the problem.
There are 13 references, 9 of which are Soviet, 1 French 1 German, 1 American, and 1 Hungarian.

PRESENTED: by S.L. Sobolev, Academician

SUBMITTED: January 3, 1958

Card 1/1

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~~16(1)~~ 16.4100, 16.4200

05702

SOV/38-23-5-6/8

AUTHOR: Yefimov, A.V.

TITLE: On the Approximation of Periodic Functions by Sums of de la Vallée Poussin

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1959, Vol 23, Nr 5, pp 737 - 770 (USSR)

ABSTRACT: Let $f(x)$ be a continuous, $2\pi$-periodic function, $S_n(f,x)$ the partial sums of its Fourier series and $\sigma_{n,p}(f,x)$ the Vallée-Poussin sums of $f(x)$. Furthermore let $V_{n,p}(f,x) = f(x) - \sigma_{n,p}(f,x)$ and $\|f(x)\| = \max_x |f(x)|$. Let $\omega_1(\delta,f)$ be the modulus of continuity and $\omega_2(\delta,f)$ the modulus of smoothness of $f(x)$. Let $\omega_1(\delta)$ be a positive function continuous in $\delta = 0$, for which it holds $0 \leq \omega_1(\delta_2) - \omega_1(\delta_1) \leq \omega_1(\delta_2 - \delta_1)$ for $0 \leq \delta_1 \leq \delta_2$. Let $\omega_2(\delta) = \sup_{|h| \leq \delta} \|f_0(x+h) - 2f_0(x) + f_0(x-h)\|$, where $f_0(x)$

Card 1/ 4

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05702
SOV/38-23-5-6/8

On Approximation of Periodic Functions by Sums of de la Vallée Poussin

is a certain continuous $2\pi$-periodic function; furthermore let (1.1) $\omega_2(\lambda\delta) \leq (\lambda + 1)\,\omega_2(\delta)$ $(\lambda > 0)$. Let $f(x) \in MH_1^{\omega}$ if $\omega_1(\delta, f) \leq M\,\omega_1(\delta)$, and $f(x) \in MH_2^{\overline{\omega}}$, if $\omega_2(\delta, f) \leq$ $\leq M\,\omega_2(\delta)$. Let $1 \cdot H_1^{\omega} = H_1^{\omega}$ and $1 \cdot H_2^{\overline{\omega}} = H_2^{\overline{\omega}}$.

The following statements are the main results of the paper:

Theorem A : For all $0 \leq p \leq n-1$ it is $\sup\limits_{f \in H_1^{\omega}} \| V_{n,p}(f,x) \| =$

$$= A_{n,p}(\omega) + O\left(\omega_1\left(\frac{1}{n}\right)\right), \text{ where}$$

$$A_{n,p}(\omega) = \begin{cases} \dfrac{C_1^{(n)}(\omega)}{\pi} \ln \dfrac{n}{p+1} & \text{for } 0 \leq p \leq \dfrac{n}{2} \\[2ex] \dfrac{2}{\pi(p+1)} \displaystyle\int_{\frac{1}{n+1}}^{\frac{1}{n-p}} \dfrac{\omega_1(t)}{t^2}\, dt & \text{for } \dfrac{1}{2}n \leq p \leq n-1 \end{cases}$$

Card 2/4

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05702
SOV/38-23-5-6/8

On Approximation of Periodic Functions by Sums of de la Vallée Poussin

Here it is :

$$C_i^{(n)}(\omega) = \sup_{f \in H_i^{\omega}} \left| \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos n x \, dx \right| \quad (i = 1,2)$$

Theorem B : For all $0 \leq p \leq n - 1$, $0 < \alpha \leq 1$ it is

$$\sup_{f \in H_2^{\alpha}} \| V_{n,p}(f,x) \| = B_{n,p}(\alpha) + O\left(\frac{1}{n^{\alpha}}\right),$$ where

Card 3/ 4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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On Approximation of Periodic Functions by Sums of de la Vallée Poussin

05702
SOV/38-23-5-6/8

$$B_{n,p}(\alpha) = \begin{cases} \dfrac{c_2^{(n)}(\alpha)}{} \ln \dfrac{n}{p+1} + O\left(\dfrac{\ln \ln n}{n^{\alpha}}\right), & 0 \leq p \leq \dfrac{n}{2},\ 0 < \alpha \leq 1 \\ O\left(\dfrac{1}{n^{\alpha}}\right), & \dfrac{n}{2} \leq p \leq n-1,\ 0 < \alpha < 1 \\ \dfrac{1}{\pi(p+1)} \ln \dfrac{n+1}{n-p}, & \dfrac{n}{2} \leq p \leq n-1,\ \alpha = 1 \end{cases}$$

Altogether there are 10 theorems and 5 lemmata. The author mentions A.N. Kolmogorov, V.T. Pinkevich, S.M. Nikol'skiy, A.F. Timan, A.D. Shcherbina. He thanks S.B. Stechkin for the theme and advice.

There are 2 figures, and 12 references, 10 of which are Soviet, 1 American, and 1 French.

PRESENTED: by I.N. Vekua, Academician
SUBMITTED: February 10, 1958

Card 4/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.

Approximation of continuous periodic functions by Fourier sums. Izv.AN SSSR Ser.mat. 24 no.2:243-296 Mr-Ap '60. (MIRA 13:7)

1. Predstavleno akad. M.A. Lavrent'yevym.
(Functions, Periodic)

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80865

16,4200

S/038/60/024/03/08/008

AUTHOR: Yefimov, A.V.

TITLE: On the Approximation of Periodic Functions by Sums of De Vallée Poussin. II.

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1960, Vol. 24, No. 3, pp. 431-468

TEXT: Let the positive function $\omega_1(\delta)$ be a modulus of continuity. Let the positive function $\omega_2(\delta)$ satisfy the conditions

(1.4) $\omega_2(0) = 0$ , $0 \leq \omega_2(\delta_1) \leq \omega_2(\delta_2)$ , $0 \leq \delta_1 \leq \delta_2$

and

(1.5) $-2\omega_2\left(\frac{\delta_2-\delta_1}{2}\right) \leq \omega_2(\delta_1) + \omega_2(\delta_2) - 2\omega_2\left(\frac{\delta_1+\delta_2}{2}\right) \leq 2\omega_2\left(\frac{\delta_2-\delta_1}{2}\right)$ , $0 \leq \delta_1 \leq \delta_2$ .

If besides

(1.6) $0 \leq \omega_2(\delta_2) - \omega_2(\delta_1) \leq \omega_2(\delta_2 - \delta_1)$ , $0 \leq \delta_1 \leq \delta_2$ ,

then $\omega_2(\delta)$ is the modulus of smoothness of $\varphi_0(x) = \frac{1}{2}\omega_2(|x|)$ for

Card 1/6

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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On the Approximation of Periodic Functions by Sums of De Vallée Poussin. II. S/038/60/024/03/08/008

$-\pi \leq x \leq \pi$, $\varphi_0(x + 2\pi) = \varphi_0(x)$. Let $\|f\| = \|f\|_{C_{2\pi}} = \max_x |f(x)|$. Let $f(x) \in MH_1[\omega]$, if $f(x)$ is $2\pi$- periodic and its modulus of continuity is $\omega_1(\delta, f) = \sup_{|h|<\delta} \|f(x+h) - f(x)\| \leq M\,\omega_1(\delta)$. Let $f(x) \in MH_2[\tilde{\omega}]$, if $f(x)$ is $2\pi$ - periodic and $\omega_2(\delta, f) = \sup_{|h|<\delta} \|f(x+h) - 2f(x) + f(x-h)\| \leq$ $\leq M\,\omega_2(\delta)$, where $\omega_2(\delta)$ satisfies (1.4), (1.5) and (1.6). If besides

$$(1.7) \quad \int_0^\delta \frac{\omega_2(z)}{z}\,dz = O(\omega_2(\delta))$$

then $f(x) \in MH_2[\omega^*]$. Let $\varphi(x)$ be a continuous $2\pi$ - periodic function. If $f(x)$ can be represented in the form

$$(1.8) \quad f(x) = \frac{a_0}{2} + \sum_{k=1}^{\infty} \frac{1}{\pi k^r} \int_{-\pi}^{\pi} \varphi(x+t) \cos\left(kt + \frac{\beta\pi}{2}\right) dt, \quad r \geq 0$$

Card 2/6

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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On the Approximation of Periodic Functions by Sums of De Vallée Poussin. II. S/038/60/024/03/08/008

then $f(x) \in M\, W_\beta^r\, H_1[\omega]$ (or $f(x) \in M\, W_\beta^r\, H_2[\tilde{\omega}]$), if $\varphi(x) \in M\, H_1[\omega]$ (or $\varphi(x) \in M\, H_2[\tilde{\omega}]$) and besides it holds

$$(1.9) \qquad \int_{-\pi}^{\pi} \varphi(x)dx = 0 \quad .$$

Let $\sigma_{n,p}(f,x)$ be the De Vallée - Poussin sum of $f(x)$ and $V_{n,p}(f,x) = f(x) - \sigma_{n,p}(f,x)$. Further let $\mathcal{E}_{\sigma_{n,p}}(W_\beta^r\, H_1[\omega]) = \sup\limits_{f \in 1 \cdot W_\beta^r H_1[\omega]} \| V_{n,p}(f,x) \|$ and $\mathcal{E}_{\sigma_{n,p}}(W_\beta^o\, H_2[\omega^*]) = \sup\limits_{f \in 1 \cdot W_\beta^o H_2[\omega^*]} \| V_{n,p}(f,x) \|$. Furthor let $C_1^{(n)}[\omega] =$

Card 3/ 6

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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80865

On the Approximation of Periodic Functions by Sums of De Vallée Poussin. II. S/038/60/024/03/08/008

$$= \sup_{f \in H_i[\omega]} \left| \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos n x \, dx \right| , \quad i = 1,2, \quad \text{and}$$

$$d_n[\omega] = \sup_{\substack{\varphi \in H_1[\omega] \\ \varphi(-t) = -\varphi(t)}} \left| \int_0^{1/n} \frac{\varphi(t)}{t} dt \right| .$$

Let $O(\varphi(n))$ denote a function $\phi(f,x,n,p)$, which for the considered functions f satisfies the conditions $|\phi| \leq C\varphi(n)$, where C is a constant not depending on x. Theorem A asserts that for all $0 \leq p \leq n$ it holds

$$\mathcal{E}_{\sigma_{n,p}}(W_\beta^0 H_1[\omega]) = A_{n,p}^\beta[\omega] + \frac{2\left|\sin \beta \frac{\pi}{2}\right|}{\pi} d_n[\omega] + O(\omega_1(\tfrac{1}{n})) , \text{ where}$$

$$A_{n,p}^\beta[\omega] = \frac{C_1^{(n)}[\omega]}{\pi} \ln \frac{n}{p+1} \quad \text{for } 0 \leq p \leq \left[\frac{n}{2}\right] \text{ and } =$$

Card 4/6

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On the Approximation of Periodic Functions by Sums of De Vallée Poussin. II.

S/038/60/024/03/08/008

$$\frac{2\left|\cos \beta \frac{\pi}{2}\right|}{\pi n} \cdot \int_{1/n}^{\frac{1}{n-p+1}} \frac{\omega_1(t)}{t^2} dt \quad \text{for} \quad \left[\frac{n}{2}\right] \leq p \leq n .$$

Theorem B asserts that for $0 \leq p \leq \left[\frac{n}{2}\right]$ it holds

$$\mathcal{E}_{\sigma_{n,p}} (W_\beta^0 H_2[\omega^*]) = \frac{C_2^{(n)}[\omega]}{\pi} \ln \frac{n}{p+1} + O(\omega_2 (\tfrac{1}{n}) \ln \gamma_n) ,$$ where $\gamma_n$

is the root of $\omega_2 (\frac{2\pi}{n} \gamma_n) = \omega_2 (\frac{1}{n}) \ln n$ . Furthermore, that

$$\mathcal{E}_{\sigma_{n,p}} (W_0^0 H_2[\omega^*]) = \frac{1}{\pi n} \int_{1/n}^{\frac{1}{n-p+1}} \frac{\omega_2(t)}{t^2} dt + O(\omega_2 (\tfrac{1}{n}))$$ for

$\left[\frac{n}{2}\right] \leq p \leq n$ and $\mathcal{E}_{\sigma_{n,p}} (W_1^0 H_2[\omega^*]) = \frac{1}{n} \sup_{\substack{\varphi \in H_2[\omega^*] \\ \varphi(-t) = -\varphi(t)}} \left| n \varphi (\frac{1}{n}) - \right.$

Card 5/6

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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On the Approximation of Periodic Functions by Sums of De Vallée Poussin. II. S/038/60/024/03/08/008

$$- (n - p + 1)\varphi\left(\frac{1}{n - p + 1}\right)\Bigg| + O(\omega_2 (\tfrac{1}{n})) \quad \text{for } \left[\frac{n}{2}\right] \leq p \leq n .$$

There are 12 theorems and 7 lemmata. The author mentions S.A. Telyakovskiy; he thanks S.B. Stechkin for the theme and advices.
There are 14 references ; 11 Soviet, 2 French and 1 Hungarian.

PRESENTED: by A.N. Kolmogorov, Academician

SUBMITTED: April 30, 1959

Card 6/6

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S/038/60/024/005/003/004
C111/C222

AUTHOR: Yefimov, A.V.

TITLE: On Linear Summation Methods for Fourier Series

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1960, Vol. 24, No. 5, pp. 743 - 756

TEXT: Let $f(x)$ be a summable $2\pi$-periodic function and $\gamma(x) = \frac{a_0}{2} + \sum_{k=1}^{\infty} (a_k \cos kx + b_k \sin kx)$ be its Fourier series. With the aid of the triangular matrix

(1.1) $\Lambda = \left\{\lambda_k^{(n)}\right\}$ $(k = 0,1,\ldots,n+1;\ n = 0,1,\ldots;\ \lambda_0^{(n)} = 1,\ \lambda_{n+1}^{(n)} = 0)$

the author forms

$$U_n(f,x,\Lambda) = \frac{a_0}{2} + \sum_{k=1}^{n} \lambda_k^{(n)}(a_k \cos kx + b_k \sin kx), \quad (n = 1,2,\ldots).$$

Card 1/4

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On Linear Summation Methods for Fourier Series

S/038/60/024/005/003/004
C111/C222

Let

$$K_n(t) = \frac{1}{2} + \sum_{k=1}^{n} \lambda_k^{(n)} \cos k t \qquad (n = 1,2,3,\ldots)$$

and

$$\Delta^2 \lambda_k^{(n)} = \lambda_k^{(n)} - 2\lambda_{k+1}^{(n)} + \lambda_{k+2}^{(n)} .$$

Theorem 1: For every sequence $\left\{\lambda_k^{(n)}\right\}$ $(k = 0,1,\ldots,n+1 ;\ n = 0,1,\ldots ;$ $\lambda_0^{(n)} = 1,\ \lambda_{n+1}^{(n)} = 0)$ it holds

$$\int_0^{\pi} |K_n(t)|\,dt \leq C_1 + C_2 \sum_{k=0}^{n-1} \frac{(k+1)(n-k)}{n+1} \left|\Delta^2 \lambda_k^{(n)}\right| + C_3 \sum_{k=0}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1}$$

where $C_1$, $C_2$, $C_3$ are absolute constants.

From theorem 1 and a result of S.M. Nikol'skiy (Ref. 3) it follows:
If $\Lambda$ satisfies the condition

Card 2/4

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84745

On Linear Summation Methods for Fourier Series S/038/60/024/005/003/004
C111/C222

(B) $$\sum_{k=0}^{n-1} \frac{(k+1)(n-k)}{n+1} \left|\Delta^2 \lambda_k^{(n)}\right| \leq C ,$$

then the conditions

(1.6) $$\lim_{n\to\infty} \lambda_k^{(n)} = 1 \quad (k = 1,2,..)$$

and

(S) $$\sum_{k=0}^{n} \frac{\left|\lambda_k^{(n)}\right|}{n - k + 1} \leq C$$

are necessary and sufficient in order that there holds

(1.3) $$\lim_{n\to\infty} U_n(f,x,\Lambda) = f(x) .$$

Card 3/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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On Linear Summation Methods for Fourier Series S/038/60/024/005/003/004
C111/C222

Theorem 2: If $\{\lambda_k^{(n)}\}$ satisfies the condition (B), then the conditions (1.6) and (S) are necessary and sufficient in order that for every summable $2\pi$-periodic function $f(x)$ in every Lebesgue point x of this function it holds

(1.2) $$\lim_{n\to\infty} U_n(f,x,\Lambda) = f(x) .$$

The author mentions D.K. Faddeyev. He thanks S.B. Stechkin for advices. There are 10 references: 3 Soviet, 2 Hungarian, 1 English, 1 Jugoslavian, 1 Polish and 2 American.

PRESENTED: by A.N. Kolmogorov, Academician

SUBMITTED: March 30, 1959

Card 4/4

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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

68966

~~16(1)~~ 16.4200 S/020/60/131/02/004/071

AUTHOR: Yefimov, A.V.

TITLE: Line Methods for the Summation of Fourier Series of Periodic Functions

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 131, Nr 2, pp 234-237 (USSR)

ABSTRACT: Let

(1) $\Lambda = \{\lambda_k^{(n)}\}$ $(k=0,1,\ldots,n+1;\ n=0,1,\ldots;\ \lambda_0^{(n)}=1,\ \lambda_{n+0}^{(n)} = 0)$

be a triangular matrix and

$$U_n(f,x,\Lambda) = \frac{a_0}{2} + \sum_{k=1}^{n} \lambda_k^{(n)}(a_k \cos kx + b_k \sin kx),$$

where $a_k$, $b_k$ are Fourier coefficients of the $2\pi$-periodic summable functions $f(x)$ Let $K_n(t) = \frac{1}{2} + \sum_{k=1}^{n} \lambda_k^{(n)} \cos kt$ denote the kernel of the method $U_n(f,x,\Lambda)$.

Theorem 1: For every matrix (1) it holds

$$\int_0^{\pi} |K_n(t)|\,dt \leq C_1 + C_2 \sum_{k=0}^{n-1} \frac{(k+1)(n-k)}{n+1} |\Delta^2 \lambda_k^{(n)}| + C_3 \sum_{k=0}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1},$$

Card 1/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

68966

Line Methods for the Summation of Fourier Series of Periodic Functions S/020/60/131/02/004/071

where $\Delta^2 \lambda_k^{(n)} = \lambda_k^{(n)} - 2\lambda_{k+1}^{(n)} + \lambda_{k+2}^{(n)}$ and $C_1, C_2, C_3$ are absolute constants.

Theorem 2: Let (1) satisfy the condition

$\sum_{k=0}^{n-1} \frac{(k+1)(n-k)}{n+1} |\Delta^2 \lambda_k^{(n)}| < C$. In order that for every $2\pi$-periodic summable function $f(x)$ in each of its Lebesgue points $x$ it holds

(2) $$\lim_{n\to\infty} U_n(f,x,\Lambda) = f(x),$$

it is necessary and sufficient that

(3) $$\lim_{n\to\infty} \lambda_k^{(n)} = 1 \quad (k=1,2,\ldots)$$

and

(4) $$\sum_{k=0}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} < C.$$

Card 2/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

68966

Line Methods for the Summation of Fourier Series of Periodic Functions S/020/60/131/02/004/071

Let $W^r_\beta H[\omega]$ be the class of functions f(x) which admit the representation

$$f(x) = \frac{a_0}{2} + \sum_{k=0}^{\infty} \frac{1}{\pi k^r} \int_{-\pi}^{\pi} \varphi(x+t)\cos(kt+\frac{\beta\pi}{2})\, dt, \quad r \geqslant 0,$$

where $\varphi(x)$ is a continuous $2\pi$-periodic function the modulus of continuity of which is $\omega(\delta, \varphi) \leqslant \omega(\delta)$, where $\omega(\delta)$ is a positive function and modulus of continuity (compare [Ref 6]); $\int_{-\pi}^{\pi} \varphi(x)dx = 0$. The author investigates the asymptotic behavior of

$$\mathcal{E}_{U_n}(W^r_\beta H[\omega]) = \sup_{f \in W^r_\beta H[\omega]} \|f(x)-U_n(f,x,\Lambda)\|_{C_{2\pi}}.$$

In two very long theorems this magnitude is estimated with respect to above, where the estimations cannot be improved, since they are asymptotic for certain linear methods. The author mentions I.M.Ginzburg, A.F.Timan, and S.M.Nikol'skiy.

Card 3/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

68966

Line Methods for the Summation of Fourier Series of Periodic Functions

S/020/60/131/02/004/071

There are 16 references, 9 of which are Soviet, 2 Hungarian, 1 English, 1 German, 1 American, 1 French, and 1 Jugoslavian.

PRESENTED: November 27, 1959, by A.N.Kolmogorov, Academician

SUBMITTED: November 27, 1959

Card 4/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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33244
S/517/61/062/000/001/003
B102/B138

16.3300

AUTHOR: Yefimov, A. V.

TITLE: Linear methods of approximating certain classes of continuous periodic functions

SOURCE: Akademiya nauk SSSR. Matematicheskiy institut. Trudy. v. 62. 1961. Sbornik rabot po lineynym metodam summirovaniya ryadov Fur'ye, 3-47

TEXT: The author investigates the approximation of continuous $2\pi$-periodic functions $f(x)$ by trigonometric polynomials

$$U_n(f,x,\Lambda) = a_0/2 + \sum_{k=1}^{n} \lambda_k^{(n)}(a_k \cos kx + b_k \sin kx),$$

where the constants $\lambda_k^{(n)}$ constitute a triangle matrix

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Card 1/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8



$$\Lambda = \begin{pmatrix} 1 & 1 & 1 & \cdots \\ 0 & \lambda_1^{(1)} & \lambda_1^{(2)} & \cdots \\ 0 & 0 & \lambda_2^{(2)} & \cdots \\ \cdot & \cdot & \cdot & \cdot \end{pmatrix} .$$

The asymptotic behavior of

$$\mathcal{E}_{U_n}(\mathfrak{M}) = \sup_{f \in \mathfrak{M}} \| f(x) - U_n(f,x,\Lambda) \|$$

is studied for certain $\mathfrak{M}$ classes. f is said to be an element of the class $MH_1[\omega]$ if its modulus of continuity,

$$\omega_1(\delta, f) = \sup_{|h| \leq \delta} \| f(x+h) - f(x) \| ,$$

satisfies the condition $\omega_1(\delta, f) \leq M\omega_1(\delta)$, where the function $\omega_1(\delta)$ fulfills



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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the inequality $0 \leqslant \omega_1(\delta_2) - \omega_1(\delta_1) \leqslant \omega_1(\delta_2 - \delta_1)$ for $0 \leqslant \delta_1 \leqslant \delta_2$; an element of the class $MH_2[\omega]$ if its modulus of differentiability, $\omega_2(\delta, f) = \sup_{|h| \leqslant \delta} \| f(x+h) - 2f(x) + f(x-h) \|$, satisfies the condition $\omega_2(\delta, f) \leqslant M\omega_2(\delta)$, where the function $\omega_2(\delta)$ fulfills the inequality $\omega_2(\lambda\delta) \leqslant (\lambda+1)\omega_2(\delta)$ for $\lambda > 0$. The classes $MW^r_\beta H_i[\omega]$ $(i = 1,2)$ contain functions $f(x) = a_0/2 + \sum_{k=1}^{\infty} (1/\pi k^r) \int_{-\pi}^{\pi} \varphi(x+t)\cos(kt + \beta\pi/2)dt$ $(r \geqslant 0)$, where $\int_{-\pi}^{\pi} \varphi(x)dx = 0$ and $\varphi(x) \in MH_i[\omega]$. A number of estimates of $\mathcal{E}_{U_n}(MW^r_\beta H_i[\omega])$ are derived. S. M. Nikol'skiy (Dokl. AN SSSR, 52, 191-193, 1946; 32, 386-389, 1941; Trudy Matem. in-ta im. V. A. Steklova AN SSSR, XV, 1945; Izv. AN SSSR, seriya matem., 4, 501-508, 1940), S. N. Bernshteyn (Soobshch. Khar'k. matem. ob-va, seriya 2, 13, 49-194, 1912), V. T. Pinkevich (Izv. AN SSSR, seriya matem., 4, 521-528, 1940), S. A. Telyakovskiy (Dokl. AN SSSR, 121, 426-429, 1958; 134, 259-262, 1960; Izv.



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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33244

Linear methods of approximating ... S/517/61/062/000/001/003
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AN SSSR, seriya matem., 24, 212-242, 1960), A. F. Timan (Dokl. AN SSSR, 81, 508-511, 1951; 84, 1147-1150, 1952; Izv. AN SSSR, seriya matem., 17, 99-134, 1953; Teoriya priblizheniya funktsiy deystvitel'nogo peremennogo - Approximation theory of functions of a real variable -, M. Fizmatgiz, 1960), I. M. Ganzburg (Dokl. AN SSSR, 128, 1958), and S. V. Stechkin (Izv. AN SSSR, seriya matem., 17, 461-472, 1953) are referred to. There are 45 references: 37 Soviet-bloc and 8 non-Soviet-bloc. The two references to English-language publications read as follows: D. Jackson. The theory of approximation. N. Y., 1930; A. Zigmund. The approximation of functions by typical means of their Fourier series. Duke Mathem. J., 12, 695-704, 1945.

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Card 4/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

YEFIMOV, A.V.

Approximation of periodic functions by De La Vallee-Poussin sums. Part 2. Izv.AN SSSR Ser.mat. 24 no.3:431-468 My-Je '61. (MIRA 14:4)

1. Predstavleno akademikom A.N.Kolmogorovym.
(Functions, Periodic)

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24168

S/039/61/054/001/001/003
C111/C222

16.4100 16.4200

AUTHOR: Yefimov, A.V. (Moscow)

TITLE: Linear methods of the approximation of continuous periodic functions

PERIODICAL: Matematicheskiy sbornik, v. 54, no. 1, 1961, 51-90

TEXT: Let f(x) be a continuous $2\pi$-periodic function,

$$\gamma(x) = \frac{a_0}{2} + \sum_{k=1}^{\infty} a_k \cos kx + b_k \sin kx)$$ be its Fourier series. With the aid of the triangular matrix

$$\Lambda = \left\{\lambda_k^{(n)}\right\} (k = 0,1,\ldots, n+1;\ n = 0,1,\ldots),\ \lambda_0^{(n)} = 1,\ \lambda_{n+1}^{(n)} = 0\ (1,1)$$

the author adjoins to every function f(x) the trigonometric polynomials (approximation method)

$$U_n(f,x,\Lambda) = \frac{a_0}{2} + \sum_{k=1}^{n} \lambda_k^{(n)}(a_k \cos kx + b_k \sin kx)\ ,\quad n = 0,1,\ldots .$$

Card 1/17

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

24168

S/039/61/054/001/001/003

Linear methods of the approximation ... C111/C222

Let $\Lambda_n(f,x) = f(x) - U_n(f,x,\Lambda)$ $\|f\| = \|f\|_{C_{2\pi}} = \max_x |f(x)|$, $E_n(f) = \inf_{t_n} \|f(x) - t_n(x)\|$, where $t_n(x)$ is a trigonometric polynomial of at most n-th order. Let furthermore : $\mathcal{E}_{U_n}(\mathfrak{M}) = \sup_{f \in \mathfrak{M}} \|\Lambda_n(f,x)\|$, where $\mathfrak{M}$ is a certain class. Let the positive function $\omega(\delta)$ be a modulus of continuity, i.e. let it satisfy

$$\omega(0) = 0, \quad 0 \leq \omega(\delta_2) - \omega(\delta_1) \leq \omega(\delta_2 - \delta_1), \quad 0 \leq \delta_1 \leq \delta_2 \quad . \tag{1.2}$$

Let $M\mathrm{Li}[\omega]$ be the class of continuous $2\pi$-periodic $f(x)$ the modulus of continuity of which $\omega(\delta,f) = \sup_{|h| \leq \delta} \|f(x+h) - f(x)\|$ satisfies the condition $\omega(\delta,f) \leq M\omega(\delta)$. Let $M\bar{H}(\omega)$ be the class of conjugate functions $\bar{f}(x)$. Let $MW^0_\beta H[\omega]$ be the class of functions

Card 2/17

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

24168

S/039/61/054/001/001/003
C111/C222

Linear methods of the approximation ...

$$f(x) = \frac{a_0}{2} + \sum_{k=1}^{\infty} \frac{1}{\pi} \int_{-\pi}^{\pi} \varphi(x+t) \cos\left(kt + \frac{\beta\pi}{2}\right) dt \qquad (1.3)$$

where $\varphi(x) \in MH[\omega]$ and $\int_{-\pi}^{\pi} \varphi(x)dx = 0$. It holds $MW_0^0 H[\omega] = MH[\omega]$, $MW_1^0 H[\omega] = M\bar{H}[\omega]$; if $\omega(\delta) = \delta^{\alpha}$ $(0 < \alpha \leq 1)$ then let $MH[\delta^{\alpha}] = MH^{\alpha}$, furthermore let $1 \cdot H[\omega] = H[\omega]$. Let $E_n(\mathfrak{M}) = \sup_{f \in \mathfrak{M}} E_n(f)$.

The author investigates the following questions :

1. Which conditions must be satisfied by $\Lambda$ in order that

$$\mathcal{E}_{U_n}(W_\beta^0 H[\omega]) = O(E_n(W_\beta^0 H[\omega]))$$

2. How the asymptotic decrease of the magnitude $\mathcal{E}_{U_n}(W_\beta^0 H[\omega])$ is depending on $\Lambda$ and $\omega(\delta)$ ?

Card 3/4

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

24168

S/039/61/054/001/001/003

Linear methods of the approximation ... C111/C222

Let the function $\omega(\delta)$ satisfy (1.2) ; if $\beta \neq 2k$ then let $\int_0^1 \frac{\omega(t)}{t}\,dt$ be convergent ; if $\beta = 2k$ then for arbitrary $\omega(\delta)$ it is put: $\sin\frac{\beta\pi}{2}\int_0^1 \frac{\omega(t)}{t}\,dt = 0$ . Let

$$\left.\begin{aligned} &\lambda_0^{(n)} = 1, \quad \lambda_{n+1}^{(n)} = 0, \quad \Delta_k = \Delta\lambda_k^{(n)} = \lambda_k^{(n)} - \lambda_{k+1}^{(n)} \quad (k = 0, 1, \ldots, n), \\ &\Delta_k^2 = \Delta^2\lambda_k^{(n)} = \lambda_k^{(n)} - 2\lambda_{k+1}^{(n)} + \lambda_{k+2}^{(n)} \quad (k = 0, 1, \ldots, n-1), \end{aligned}\right\} \quad (2.3)$$

$$h_1(n, \Lambda) = \sum_{k=0}^{\left[\frac{n+1}{2}\right]-1} (k+1)|\Delta_k^2|, \quad h_2(n, \Lambda) = \sum_{k=\left[\frac{n+1}{2}\right]}^{n-1} (n-k)|\Delta_k^2|, \quad (2.4)$$

$$h(n, \Lambda) = \sum_{k=0}^{n-1} \frac{(k+1)(n-k)}{n+1}|\Delta_k^2|, \quad (2.5)$$

$$h[\omega, n, \Lambda] = \sum_{k=0}^{n-1} \frac{(k+1)(n-k)}{n+1}\,\omega\left(\frac{1}{k+1}\right)|\Delta_k^2| + \omega\left(\frac{1}{n}\right). \quad (2.6)$$

Card 4/17

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

24168
S/039/61/054/001/001/003
Linear methods of the approximation ... C111/C222

Thoerem 1: It holds uniformly for all $f(x) \in W_\beta^0 H[\omega]$ :

$$\Lambda_n(f, x) = f(x) - U_n(f, x, \Lambda) =$$

$$= \frac{1}{2\pi^2} \sum_{k=\nu+3}^{n} \lambda_k^{(n)} \sum_{l=\left[\frac{n+1}{n-k+2}\right]+1}^{\left[\frac{n+1}{n-k+1}\right]} \frac{1}{l^2} \int_0^{2l\pi} \left[\varphi\left(x - \frac{t}{n} - \frac{3+\beta}{2n}\pi\right) - \right.$$

$$\left. - \varphi\left(x + \frac{t}{n} + \frac{5-\beta}{2n}\pi\right)\right] \cos t \, dt +$$

$$+ \frac{\cos\frac{\beta\pi}{2}}{\pi} \left\{ \sum_{k=0}^{\nu-1} \Delta^2 \lambda_k^{(n)} \int_{\frac{1}{k+2}}^{1} \frac{2\varphi(x) - \varphi(x+t) - \varphi(x-t)}{t^2} \, dt + \right.$$

Card 5/14

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8



$$+\Delta\lambda_{\nu}^{(n)}\int_{\frac{1}{\nu+2}}^{1}\frac{2\varphi(x)-\varphi(x+t)-\varphi(x-t)}{t^2}\,dt\Bigg\}+$$

$$+\frac{\sin\frac{\beta\pi}{2}}{\pi}\Bigg\{\sum_{k=0}^{\nu-1}(k+1)\,\Delta^2\lambda_k^{(n)}\int_{\frac{1}{n}}^{\frac{1}{k+1}}\frac{\varphi(x-t)-\varphi(x+t)}{t}\,dt+$$

$$+\int_{0}^{\frac{1}{n}}\frac{\varphi(x-t)-\varphi(x+t)}{t}\,dt\Bigg\}+O(h[\omega,n,\Lambda]),$$



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8



where $h[\omega, n, \Lambda]$ and $\Delta^2 \lambda_k^{(n)}$ are defined by (2.6) and (2.3), and $\gamma = \left[\frac{n+1}{2}\right]$.

Let

$$C_1^{(n)}[\omega] = \sup_{f \in H[\omega]} \left| \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos nx \, dx \right|,$$

$$C_1^{(n)}(\alpha) = \sup_{f \in H^\alpha} \left| \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos nx \, dx \right| = \frac{2^{1+\alpha}}{\pi} \int_0^{\frac{\pi}{2}} t^\alpha \sin t \, dt \cdot \frac{1}{n^\alpha},$$

$$d_n[\omega] = \sup_{\substack{f \in H[\omega] \\ \varphi(-t) = -\varphi(t)}} \left| \int_n^{\frac{1}{n}} \frac{\varphi(t)}{t} \, dt \right| \quad (n = 1, 2, \ldots)$$

$$d_{n,k}[\omega] = \sup_{\substack{f \in H[\omega] \\ \varphi(-t) = -\varphi(t)}} \left| \int_{\frac{1}{\alpha}}^{\frac{1}{k+1}} \frac{\varphi(t)}{t} \, dt \right| \quad (n = 0, 1, \ldots; k = 0, 1, \ldots, n-1).$$



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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Theorem 2 : For every sequence $\left\{ \lambda_k^{(n)} \right\}$ and für every modulus of continuity there hold the inequalities

$$\mathscr{E}_{U_n}(W_\beta^\omega H[\omega]) \leqslant \frac{C_1^{(n)}[\omega]}{\pi} \sum_{k=\nu+2}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} + \frac{2\left|\sin\frac{\beta\pi}{2}\right|}{\pi} d_n[\omega] +$$

$$+ \frac{2\left|\cos\frac{\beta\pi}{2}\right|}{\pi} \left\{ \sum_{k=0}^{\nu-1} |\Delta^2\lambda_k^{(n)}| \int_{\frac{1}{k+2}}^{1} \frac{\omega(t)}{t^2} dt + |\Delta\lambda_\nu^{(n)}| \int_{\frac{1}{\nu+2}}^{1} \frac{\omega(t)}{t^2} dt \right\} +$$

$$+ \frac{2\left|\sin\frac{\beta\pi}{2}\right|}{\pi} \sum_{k=0}^{\nu-1} (k+1) |\Delta^2\lambda_k^{(n)}| d_{n,k}[\omega] + O(h[\omega, n, \Lambda]), \qquad (4.1)$$



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8



$$\mathscr{E} u_n(H[\omega]) \leqslant \frac{C_1^{(n)}[\omega]}{\pi} \sum_{k=\nu+3}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} +$$

$$+ \frac{2}{\pi}\left\{\sum_{k=0}^{\nu-1} |\Delta^2\lambda_k^{(n)}| \int_{\frac{1}{k+2}}^{1} \frac{\omega(t)}{t^2}dt + |\Delta\lambda_\nu^{(n)}| \int_{\frac{1}{\nu+2}}^{1} \frac{\omega(t)}{t^2}dt\right\} + O(h[\omega, n, \Lambda]) \quad (4.2)$$

$$\mathscr{E} u_n(H[\omega]) \leqslant \frac{C_1^{(n)}[\omega]}{\pi} \sum_{k=\nu+3}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} + \frac{2}{\pi}\sum_{k=0}^{\nu} \omega\left(\frac{1}{k+1}\right)|\Delta\lambda_k^{(n)}| + O(h[\omega, n, \Lambda]). \quad (4.2')$$

$$\mathscr{E} u_n(\overline{H}[\omega]) \leqslant \frac{C_1^{(n)}[\omega]}{\pi} \sum_{k=\nu+3}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} + \frac{2}{\pi} d_n[\omega] +$$

$$+ \frac{2}{\pi}\sum_{k=0}^{\nu-1} (k+1)|\Delta^2\lambda_k^{(n)}|\, d_{n,k}[\omega] + O(h[\omega, n, \Lambda]). \quad (4.3)$$



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8



If the modulus of continuity $\omega(\delta)$ satisfies the condition

$$\delta \int_{\delta}^{1} \frac{\omega(t)}{t^2}\, dt = O(\omega(\delta)) \tag{4.4}$$

then it holds

$$\mathcal{E}_{U_n}(H[\omega]) \leq \frac{C_1^{(n)}[\omega]}{\pi} \sum_{k=\nu+3}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} + O(h[\omega, n, \Delta]) \,. \tag{4.5}$$

If $\omega(\delta)$ satisfies the condition

$$\int_{0}^{\delta} \frac{\omega(t)}{t}\, dt = O(\omega(\delta)) \tag{4.6}$$

then it holds

$$\mathcal{E}_{U_n}(\bar{H}[\omega]) \leq \frac{C_1^{(n)}[\omega]}{\pi} \sum_{k=\nu+3}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} + O(h[\omega, n, \Delta]) \tag{4.7}$$



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8



Here $h[\omega, n, \Lambda]$, $\Delta \lambda_k^{(n)}$, $\Delta^2 \lambda_k^{(n)}$ are defined by (2.6) and (2.3), $\nu = \left[\frac{n+1}{2}\right]$. In the class of all linear methods the inequalities (4.1)-(4.3), (4.5) and (4.7) cannot be improved since there exist linear methods for which they become equations.

Theorem 3: If the sequence $\{\lambda_k^{(n)}\}$ satisfies the conditions

$$\sum_{k=0}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} \leq C, \quad \sum_{k=\nu+1}^{n} (n-k)|\Delta^2 \lambda_k^{(n)} \leq C$$

and

$$\sum_{k=0}^{\nu-1} |\Delta^2 \lambda_k^{(n)}| \int_{\frac{1}{k+2}}^{1} \frac{\omega_0(t)}{t^2} dt + |\Delta \lambda_\nu^{(n)}| \int_{\frac{1}{\nu+2}}^{1} \frac{\omega_0(t)}{t^2} dt \leq C\, \omega_0\left(\frac{1}{n}\right)$$

where $\nu = \left[\frac{n+1}{2}\right]$ and $\omega_0(\delta)$ is a positive function being a modulus of



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8



continuity then the approximation method $U_n(f,x,\lambda)$ yields an approximation of the order $E_n(H[\omega])$ on all classes $H[\omega]$ for which $\omega(\delta)$ satisfies the conditions :

a) $$\delta\int_{\delta}^{1}\frac{\omega(z)}{z^2}dz \leqslant C_1\omega(\delta),$$

б) $$\frac{\delta_1\int_{\delta_1}^{1}\frac{\omega_0(t)}{t^2}dt}{\omega(\delta_1)} \leqslant C_2\frac{\delta\int_{\delta}^{1}\frac{\omega_0(t)}{t^2}dt}{\omega(\delta)} \quad (0<\delta_1<\delta\leqslant\delta_0<1).$$

Theorem 4 : If the sequence $\{\lambda_k^{(n)}\}$ satisfies the conditions



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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24168
S/039/61/054/001/001/003
C111/C222

Linear methods of the approximation ...

$$\sum_{k=\nu+3}^{n} \frac{|\lambda_k^{(n)}|}{n-k+1} \leqslant C \frac{\int_0^{\frac{1}{n}} \frac{\omega(t)}{t} dt}{\omega\left(\frac{1}{n}\right)}, \qquad (A)$$

$$\sum_{k=0}^{\nu-1} (k+1) |\Delta^2 \lambda_k^{(n)}| \int_{\frac{1}{n}}^{\frac{1}{k+1}} \frac{\omega(t)}{t} dt \leqslant C \int_0^{\frac{1}{n}} \frac{\omega(t)}{t} dt \qquad (B)$$

$$\sum_{k=\nu+1}^{n-1} (n-k) |\Delta^2 \lambda_k^{(n)}| \leqslant C \frac{\int_0^{\frac{1}{n}} \frac{\omega(t)}{t} dt}{\omega\left(\frac{1}{n}\right)}. \qquad (C)$$

Card 13/14

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8"

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where $\nu = \left[\frac{n+2}{2}\right]$, C is an absolute constant then $U_n(f,x,\Lambda)$ yields an approximation of the order $E_n(\bar{H}[\omega])$ on the class $\bar{H}[\omega]$.

The method $U_n(f,x,\Lambda)$ is called neighboring to Fourier sums on the class $H[\omega]$ if

$$\sum_{k=0}^{\nu} \omega\left(\frac{1}{k+1}\right)\left|\Delta \lambda_k^{(n)}\right| = O\left(\omega\left(\frac{1}{n}\right)\right), \tag{4.8}$$

it is called neighboring to Fourier sums on $\bar{H}[\omega]$ if

$$\sum_{k=0}^{\nu-1} (k+1)\left|\Delta^2 \lambda_k^{(n)}\right| d_{n,k}[\omega] = O\left(\omega\left(\frac{1}{n}\right)\right), \tag{4.9}$$

and it is called neighboring to Feyer sums if

$$\sum_{k=\nu+1}^{n} \frac{\left|\lambda_k^{(n)}\right|}{n-k+1} = O(1) \tag{4.10}$$



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"APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001962320019-8

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Linear methods of the approximation ...

Theorem 5 : If $\left\{\lambda_k^{(n)}\right\}$ satisfies the conditions

$$\Delta\lambda_k^{(n)} \geqslant 0 \quad \text{or} \quad \Delta_k^{(n)} \leq 0 \quad \text{for all} \quad k = 0,1,\ldots,\nu \tag{7.1}$$

$$\lambda_k^{(n)} \geqslant 0 \quad \text{or} \quad \lambda_k^{(n)} \leq 0 \quad \text{for all} \quad k = \nu+3,\ldots,n \tag{7.2}$$

then it holds

$$\mathcal{E}_{U_n}(H[\omega]) = \gamma_n[\omega,\Lambda]\left\{\frac{C_1^{(n)}[\omega]}{\pi}\left|\sum_{k=\nu+3}^{n}\frac{\lambda_k^{(n)}}{n-k+1}\right| + \frac{2}{\pi}\left|\sum_{k=0}^{\nu}\omega\left(\frac{1}{k+1}\right)\Delta\lambda_k^{(n)}\right|\right\} + O(h[\omega,n,\Lambda]) \tag{7.3}$$

where $\nu = \left[\frac{n+1}{2}\right]$ , $1/4 \leq \gamma_n[\omega,\Lambda] \leq 1$ , where $\gamma_n[\omega,\Lambda] = 1$ for methods being neighboring to the Fourier sums on $H[\omega]$ or being neighboring to the Feyer sums ; for convex moduli of continuity satisfy-

Card 15/17

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24168
S/039/61/054/001/001/003
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Linear methods of the approximation ...

ing $$\omega(\delta_1) + \omega(\delta_2) \leq 2\omega\left(\frac{\delta_1 + \delta_2}{2}\right) \quad (0 \leq \delta_1 \leq \delta_2) \tag{1.4}$$

it holds $1/2 \leq \gamma_n[\omega, \Lambda] \leq 1$. If $\omega(\delta)$ satisfies the condition

$$\delta \int_{\delta}^{1} \frac{\omega(t)}{t^2}\, dt = O(\omega(\delta)) \tag{4.4}$$

then for every sequence $\left\{\lambda_k^{(n)}\right\}$ satisfying (7.2) it holds

$$\mathcal{E}_{U_n}(H[\omega]) = \frac{c_1^{(n)}[\omega]}{\pi} \left| \sum_{k=\nu+3}^{n} \frac{\lambda_k^{(n)}}{n-k+1} \right| + O(h[\omega, n, \Lambda]) . \tag{7.4}$$

Theorem 6 contains an analogous assertion for the class $\overline{H}[\omega]$.

Beside of the given basic results the paper contains a great number of auxiliary theorems, estimations, conclusions, lemmas etc.

The author mentions S.N. Bernshteyn, A.N. Kolmogorov, A.F. Timan,

Card 16/17

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