Sectt. II-27—58,004—27-10-47.

E & A (1948) Department.

1/s. SERIES.

G.O. NO. 2126

Dated 27-8-48

[Despatch Abstract.]

M E J — Sri A. Sivasan — Apptd. temporarily as Prof. of Elec. Engg., Engg. College, Anantapur.

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EDUCATION DEPARTMENT.



D.S. REDDI, ESQ., M.A.(Oxon.),
Director of Public Instruction,
Madras.

The Secretary to Government,
Education and Public Health Department,
Madras.

R.CL. No. 25/47, Dated the 27th April, 1948.

Sir,

30891

B/0025

Subject:- Madras Educational Service - Mr. R.C. Advani - appointment as Professor of Electrical Engineering, Arthur Hope College of Technology, Coimbatore.

Reference:- G.O. Ms.No.802 Edn., dated 6th April 1948.

I have the honour to state that Mr. R.C. Advani has joined duty as Vice-Principal of the Central Institute for training Instructors, Koni, Bilaspur (C.P.) under the Government of India, in view of the fact that there was some delay in the issue of orders of appointment by the Government of Madras, and as the Ministry of Labour at the same time were most anxious that he should take up the post of Vice-Principal immediately and start the work at Koni. As, however, the appointment under the Government of India is stated to be temporary Mr. R.C. Advani has written to say that he proposed to give one month's notice to his present employers and join duty as Professor of Electrical Engineering, A.H.College, Coimbatore, on the expiry of the period

P.T.O.

period of notice. I am permitting him to do so. In these circumstances I have the honour to inform Government that there may be a little delay in Mr. R.C. Advani joining duty as Professor of Electrical Engineering, A.H.College of Technology, Coimbatore.

I have the honour to be,
Sir,
Your most obedient servant,

For DIRECTOR OF PUBLIC INSTRUCTION.

NB/27-4.

From,

Sri A. Srinivasan
Deputationist returned from U.S.A.
College of Engineering
Guindy, Madras-15.

To,

The Secretary to Government
Education Department
Fort St. George
Madras.

Thro' The Proper Channel

Sir,

Sub: Request for appointment as Professor of Electrical Engineering, Arthur Hope College of Technology, Coimbatore.

From an interview that the Hon'ble Sri T.S. Avanashilingam Chettiar, the Minister for Education was good enough to grant me, I learnt that a refugee officer from outside the Province is likely to be appointed as Professor of Electrical Engineering of the Arthur Hope College of Technology, Coimbatore, in preference over me.

It appears to have been the policy of the Government of Madras, as of other Provincial Governments in India, to fill up posts in all its departments by promotion of their officers, and to get officers from outside the Presidency only when qualified men are not available in the service. I, therefore, venture to think that the Government may have decided to appoint a man from outside the Province without full knowledge of my qualifications, and beg to submit details of my experience and qualifications to enable the Government to see if by the appointment of an outsider, hardship and injustice is not caused to a permanent servant of the Government of Madras, who should be considered competent to discharge adequately the duties of a Professor of Electrical Engineering, particularly when he would have been appointed as Professor in 1947-48 session had he not been deputed for advanced studies to U.S.A.

(P.T.O.)

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After passing out of the College of Engineering, I had 1½ years' practical experience in the P.W.D. Workshops, Madras and Saxby & Farmer, Signal Engineers, Calcutta. After that I worked for 2 years as Shift Engineer in the College Power House and have been on the staff of the Electrical Engineering Department since 1934.

I was intimately associated with the erection and commissioning of equipment worth about 5 lacs of rupees which was purchased for Electrical Engineering Laboratory since I started working in that laboratory. I was fully responsible for the fitting up of the High Voltage Laboratory and was in charge of it till my departure for U.S.A. in November 1945.

I had lectured to the Senior Classes in Electrical Engineering subjects for several years before proceeding to U.S.A.

In addition to the normal teaching work and the extra work of organization of a new laboratory, I engaged myself in research since 1937 and was awarded the M. Sc. Degree in Electrical Engineering of the Madras University in 1943.

A slightly senior colleague of mine in the Electrical Engineering Laboratory of the College, Sri K.N. Ramanathan who has about the same experience as myself and who is also a holder of the M. Sc. degree of the University of Madras, was appointed as Professor of Electrical Engineering of the Arthur Hope College of Technology, Coimbatore in 1946. The Professorship of Electrical Engineering was sanctioned for the College of Engineering, Cocanada in 1947-48 session. I should think that the Government would have had no hesitation in appointing me as Professor of Electrical Engineering at College of Engineering, Cocanada had I not been away on deputation at that time.

An unfortunate drawback with which I suffer is in the matter of designation. I had the designation of an Electrical Laboratory Assistant through out my service in the Electrical Engineering Department. This was not due to lack of ability but solely due to lack of vacancies in the higher posts. My colleague, referred to above, who is now a Professor of Electrical Engineering also remained in this category for as long a period and was only promoted to a gazetted post of an Instructor

(P.T.O)

less than 2 years before his appointment as Professor. I, therefore, trust that the Government have not been influenced by my designation in preferring an outsider over me and they would take into consideration the nature of the work done by me.

It is a great shock, surprise and discouragement to me that after gaining greater teaching and research experience, an unusual type of practical experience and a number of distinctions, as detailed below, the Government propose to appoint an outsider as Professor in preference over me.

During my two years' stay in U.S.A. I spent 1½ years in post-graduate study, research and teaching at the Illinois Institute of Technology, Chicago, and thereafter had 6 months practical experience of an unusual character in the Design and Development Department of Allis-Chalmers Manufacturing Co., Pittsburgh, one of the leading electrical manufacturers of the world.

Post-graduate study, teaching and research:--

Besides advanced Engineering subjects relating to my field of specialisation, my post-graduate study comprised advanced mathematics, and advanced physics, far beyond the standard in the Engineering Colleges, but essential for research, which I am expected to carry out and guide as a member of staff of the College. Through this post-graduate study I am better equipped for higher teaching than I was before I went abroad.

At the Illinois Institute of Technology, Chicago, I had the honour of being invited to lecture to the final year Electrical Engineering Class in A.C. Machinery throughout my stay at the Institute. I am enclosing a certificate from the Head of the Electrical Engineering Department, Dr. Rader, regarding my teaching and post-graduate work. As this certificate is very short, I am reproducing it below:--

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> "This is to certify that Mr. A. Srinivasan has taught classes for us during the last one and a half years and has proven himself to be an excellent and dependable instructor. Both in his teaching and in work leading toward his master's degree at this Institution Mr. Srinivasan has performed very creditably all duties assigned to him."

(P.T.O.)

Besides doing research in a partial requirement of the degree of Master of Science, I was honoured by the Director of Electrical Engineering Department by being invited to carry out a number of investigations that were referred to him in his capacity as an expert and consultant.

The results of researches carried out by me are contained in 3 papers. Two of them have been accepted for publication in the Transactions of the American Institute of Electrical Engineers and I presented them, on invitation, at the National Convention of American Institute of Electrical Engineers at New York and Chicago, which were attended by eminent Electrical Engineers from all over U.S.A. and Canada. The third paper has been offered for publication in Transactions of American Institute of Electrical Engineers and has been referred back to me for modification before publication.

I may be permitted to state that I am the only Indian who had the honour to present a paper before a Convention of American Institute of Electrical Engineers and that no deputationist who has been sent abroad under the Government of India scheme either to U.K. or U.S.A. or Canada has so far made as many original contributions as I have.

Practical experience:-- I had a unique type of practical experience. The Design and Development Department of every manufacturer is a "closed door" department to which even the employees of that firm, not connected directly with that department are not admitted, much less an alien like myself. Allis-Chalmers Manufacturing Co., one of the largest Electrical Manufacturers of the world permitted me to work for 6 months in their Design and Development section to make use of my research experience and to consult me on various problems that they had. The work done by me is outlined in the enclosed certificate from the Engineer-in-Charge of that Company who is equivalent to a Chief Engineer. In the concluding paragraph of the certificate, the Engineer-in-Charge has written as follows:-

(P.T.O.)

> "It is the opinion of all of us in the Engineering Department that he is an exceedingly able and well informed engineer and a fine gentleman. We have gained much from his association with us and he has contributed materially to the progress of engineering activities in this plant. It was a great pleasure to have him here and we regret that circumstances were such that he could not remain longer with us. He reflects great credit on his homeland and the institutions of learning there through which he obtained his engineering knowledge."

Memberships gained:-- I was already an Associate Member of the Institution of Engineers (India) before proceeding to U.S.A. I was elected Associate Member of the American Institute of Electrical Engineers when I was in U.S.A.

I was elected as a full Member of Sigma Xi Society which is regarded as a distinction in U.S.A. and Canada, and only research workers of considerable ability are elected as members. The society has eminent scientists like Einstein and atomic energy scientists like Compton, Fermi, etc. as members. I am the only Indian who is a full member of the Society so far.

I was also elected a member of EtaKappa Nu Society of Electrical Engineers whose membership is considered distingtion in U.S.A. and Canada, and to which only outstanding Electrical Engineers are elected.

Visits and Contacts:-- I visited several leading universities in U.S.A. and U.K. and had contacts and discussions with eminent professors. I also visited a large number of leading electrical manufacturers in U.S.A. and U.K. and had technical discussions with their research and design engineers. I was received everywhere with great honour and my cooperation was sought everywhere for collaboration in research. I have even been offered facilities for conducting investigations on their behalf in India.

Conclusion:-- In conclusion I submit that had I not gone abroad I shoud have been a professor of electrical engineering early in the 1947-48 session.

I further submit that my record in U.S.A. entitles me to consider myself much better qualified for the post of a Professor of Electrical Engineering now than before I went to U.S.A.

(P.T.O.)

Eminent engineers of U.S.A. and U.K. who sought my cooperation in their reseaches made me feel that the research done by me was of some value, and had filled me with enthusiasm for further research. I am naturally feeling very depressed and discouraged that the Government have such a poor opinion of me that they propose to appoint an outsider in preference over me. I only hope that they are doing so in the absence of a full knowledge of my qualifications and experience and trust that my claims will be fully considered before the appointment of an outsider is finally made.

I beg to remain,
Sir,
Your most obedient servant,
A Srinivasan
(A. Srinivasan)

Madras
March 29, 1948

Encl:
1. Certificate from Dr. Rader
2. Certificate from Mr. Cook.
3. & 4. Reprints of the two published papers.

Advance copy submitted to The Secretary to Government, Education Department.

" " " The Director of Public Instruction, Madras.

Submitted to the Director of Public Instruction with remarks contained in my letter RC No 14-A/48 dated 3.4.48 concerning
D. P. Rader
3.4.48
Principal

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ILLINOIS INSTITUTE OF TECHNOLOGY

A Consolidation of Armour Institute of Technology and Lewis Institute.

TECHNOLOGY CENTER, CHICAGO 16.

June 23, 1947.

TO WHOM IT MAY CONCERN:

This is to certify that Mr. A. Srinivasan has taught classes for us during the last one and a half years and has proven himself to be an excellent and dependable instructor. Both in his teaching and in work leading toward his masters degree at this Institution, Mr. Srinivasan has performed very creditably all duties assigned to him.

Very truly yours,

(Sd.) Louis T. Rader, Director

Department of Electrical Engineering.

(TRUE COPY)

10 -47 11

ALLIS-CHALMERS MANUFACTURING COMPANY

Main Office - Box 512 - Milwaukee 1, Wis.

(10)

December 17, 1947.

To Whom It May Concern:

Mr. A. Srinivasan -- Engineering Activities while at the Pittsburgh Works of the Allis-Chalmers Manufacturing Company.

Following completion of his studies at Illinois Institute of Technology, Chicago, Illinois, Mr. Srinivasan embarked on a six months special Graduate Training Course in the Engineering Development Section, Pittsburgh works of Allis-Chalmers Manufacturing Company. He started this work on June 23, 1947 and completed it on November 28, 1947, - with approximately one month work still remaining in his itinerary, to be spent in Norwood, Ohio, and Milwaukee, Wisconsin, Works of the Company.

His major accomplishments while at the Pittsburgh Works were as follows:

1. A study of electrical transformer design to determine the most economical design of a power transformer, with a given set of guarantees to meet and a given price of active materials (copper and core steel). Mr. Srinivasan prepared and submitted a comprehensive report covering this works.

2. A study of the temperature rises of over four-hundred power transformers built at Pittsburgh works and the evolution of an accurate and simple method of determining the temperature rise (in the design stage) of the windings of oil-immersed, self-cooled power transformers under steady state conditions. Mr. Srinivasan summed up this work in a very able report.

3. A study of the temperature ratings of power transformers designed to meet guaranteed rises other than the American standard of 55 °C. ~~ratings for~~ This included the derivation of multiplying constants for varying kVA capacities, to arrive at equivalent 55°C. ratings for pricing purposes. This work was also well covered in a report.

Additional very worthy activities in which Mr. Srinivasan engaged were as follows:

1. Assistance in an oscillographic study of transient surges to determine their effect on the insulation of a dry type transformer when the no-load circuit breaker was opened on the primary input circuit.

2. A study of the present Allis-Chalmers design methods for both power and distribution transformers; also a study of new design standards now comtemplated, for the purpose of reducing weight, size and costs.

3. Thorough study and observation of the manufacturing processes and methods used in this plant, in order to gain knowledge of American methods of mass production of electrical equipment.

In addition to the above he was very cooperative in offering helpful suggestions, gained from his knowledge and experience, on many of the general problems that arose in the Engineering, Development Section during his stay there.

It is the opinion of all of us in the Engineering Department that he is an exceedingly able and well informed engineer and a fine gentleman. We have gained much from his association with us and he has contributed materially to the progress of engineering activities in this plant. It was a great pleasure to have him here and we regret that circumstances were such that he could not remain longer with us. He reflects great credit on his homeland and the institutions of learning there through which he obtained his engineering knowledge.

Respectfully,

(Sd.) P.E. Cook.

Engineer-in-Charge,
Allis-Chalmers Manufacturing Company,
Pittsburgh Works.

(TRUE COPY)

12 127 B

Rc.No.14 A/48. College of Engineering, Guindy, Madras-15, Dated: 3rd April 1948.

To

The Director of Public Instruction,
M A D R A S.

Sir,

Sub: Application of Mr.A.Srinivasan for appointment as Professor of Electrical Engineering at the Arthur Hope College of Technology, Coimbatore.

I am herewith enclosing the application of Mr.A.Srinivasan for appointment as Professor of Electrical Engineering, at the Arthur Hope College of Technology, Coimbatore and submit below my remarks thereon.

2. In my D.O. letters 509/47 dated 28-11-47 and 22-12-47 with reference to your D.O. letters 47/47 of 26-11-47 and December 1947, I have already recommended the appointment of Mr. A.Srinivasan as Professor of Electrical Engineering of the Arthur Hope College of Technology, Coimbatore. At that time, I did not have as much information about Mr.Srinivasan as I now have through my contact with him after his return to India, about ten days back. I find that Mr.Srinivasan has a much stronger case for appointment as Professor of Electrical Engineering than would appear from my D.O. of 22-12-1947. I am therefore submitting details of qualifications and experience of Mr.Srinivasan including important information which has come to my knowledge after Mr.Srinivasan's return to India.

3. It has been the policy of the Government to fill up a gazetted post by direct recruitment only when they are unable to find one of their serving Officers suitable for promotion to that post. I would therefore request the Director to give the most careful consideration to the application of Mr.Srinivasan and my remarks thereon, as the appointment of a direct recruit as Professor without the full st consideration of the claims of Mr.Srinivasan will have amost demoralising effect on the existing staff of the colleges and would make the already unpopular service in the Engineering Colleges still more unpopular.

P.T.O.

I. QUALIFICATIONS AND EXPERIENCE OF MR.A.SRINIVASAN BEFORE PROCEEDING TO U.S.A. IN 1945.

4. Mr.Srinivasan was Electrical Laboratory Assistant in the College from 1934 to the end of 1945, when he was deputed to U.S.A., for advanced training. The only reason why Mr.Srinivasan was an Electrical Laboratory Assistant till the end of 1945 is that there was no vacancy in a higher post. He was promoted to a gazetted post just before he left for U.S.A., but could not take charge as he had to leave for U.S.A.

5. Although Mr.Srinivasan was holding a junior post in the College, the work done and experience gained by him were of the nature normally associated with a senior post. I am responsible for this and I shall explain the reasons which impelled me to do this.

6. When I came as Professor of Electrical Engineering to the College in 1935, Mr.Srinivasan and other Laboratory Assistants confined themselves merely to Laboratory and tutorial classes. I did not think that this was either good for the men themselves, or for the institution or for providing senior teachers in future. I therefore urged them to take to research and be prepared to shoulder greater responsibilities. At the time of my appointment as Professor, the work of fitting up the new Electrical Engineering Laboratory had just commenced. I gave the Laboratory Assistants responsible work in organising the laboratory. The three Laboratory Assistants worked as a team in the organisation of the laboratory as a whole, and each one of them was given the primary responsibility for developing a section of the Laboratory. Mr.Srinivasan's special task was the organisation of the High Voltage Laboratory of which he had full charge till he left for U.S.A.

7. Mr.Srinivasan started research in 1937, although he was still preoccupied with the fitting up of the Electrical Engineering Laboratory which took several years to do, as students were working in the Laboratory during the session and the organisation work could only be carried out during holidays and vacation.

8. After Mr.Srinivasan and other Laboratory Assistants had

course of a year and ahalf, and that they had the distinction of being presented at the annual Convention of the American Institute of Electrical Engineers are something that an Engineer of any country in the world may be proud of. In practically all the professional institutions, there are two types of papers, (1) for publication after presentation and (2) forpublication. The former are generally regarded as more creditable than the latter.

16. Mr.Srinivasan has produced a third paper which is expected to be published in the Transactions of the American Institute of Electrical Engineers. This is another feather in his cap.

17. The authorities of the Indian Government have had great difficulty in arranging the practical training of our students in U.S.A. Mr.Srinivasan succeeded in not only getting his practical training arranged through his college, but also in getting practical training of a most unusual character, in the Design and Development Department of Messrs.Allis-Chalmers, one of the leading Electrical Firms in U.S.A. The Design and Development Department of a manufacturing firm is a 'Holy of the Holies', and Messrs.Allis-Chalmers must have had a high appreciation of the ability of and usefulness of the Mr.Srinivasan to have admitted him into that Department and allowed him to do the kind of work that he did. It appears to me from the certificate given to Mr.Srinivasan by the Chief Engineer of Messrs.Allis-Chalmers that the Engineers of that firm regarded him, not as a member of staff of the subordinate educational service of the Government of Madras, but as a man worth consulting. Although the opinion of the Engineers of Messrs.Allis-Chalmers has been extracted in the application of Mr.Srinivasan, I am reproducing it here as it is a magnificent testimonial. The extract reads as follows:

> "It is the opinion of all of us in the Engineering Department that he is an exceedingly able and well-informed engineer and a fine gentleman. We have gained much from his association with us and he has contributed materially to the progress of engineering activities in this plant. It was a great pleasure to have him here and we regret that circumstances were such that he could not remain longer

with us. He reflects great credit on his homeland and the institutions of learning there through which he obtained his engineering knowledge".

18. Mr.Srinivasan has gained Memberships of important Societies which I know are coveted in U.S.A. I know of senior American-trained Engineers who are proud of displaying the insignias of these Societies on their watch-chains.

19. While Mr.Srinivasan was in England en route to India he visited a number of leading Electrical Manufacturing Works and came in contact with their Design Engineers. They were all deeply interested in the work done by Mr.Srinivasan and were eager to get the knowledge acquired by him. These Engineers must have thought very highly of him to offer their co-operation in further researches of Mr.Srinivasan.

20. I need hardly say that Mr.Srinivasan has distinguished himself and has brought credit to his country and to the College. From my conversations with Mr.Srinivasan and a perusal of his published papers, I find that he has attained a much higher professional standing than I had thought him capable of when he was in India. I think that there is an explanation for this which applies to many of us.

21. While Mr.Srinivasan was in India, his development had been retarded through his very long period of service with a junior status and the bleak prospect that he had before him for many years. The environment under which he worked in the U.S.A., the confidence reposed on him by eminent Professors of his College and the prospect of his appointment as Professor on his return to India appear to be responsible for the profound change that has taken place in him.

22. From the long conversations that I have had with Mr. Srinivasan, I found him to be full of fine ideas for reorganisation of our system of education, and enthusiasm for doing big things. But since the day of his interview with the Hon'ble Minister for Education, a gloom has come over him. The future usefulness of Mr.Srinivasan will depend upon how the Government deal with his application.

III. MR.A.SRINIVASAN'S CLAIMS FOR APPOINTMENT AS PROFESSOR OF ELECTRICAL ENGINEERING AT THE COIMBATORE COLLEGE.

23. I should think that, since Mr.K.N.Ramanathan, a slightly senior colleague of Mr.Srinivasan in service, but of the same batch in the College, had been appointed Professor of Electrical Engineering in 1946, Mr.A.Srinivasan would have been appointed Professor of Electrical Engineering of the Cocanada College sometime in 1947, had he not gone abroad.

24. I submit that through his distinguished record in the U.S.A., Mr.Srinivasan is not only better qualified for appointment as Professor than he was before proceeding to U.S.A., but possesses that qualification which is of the highest importance in all teachers, whether of Arts, Science, Engineering, or Technology, and which very few teachers in our Colleges possess.

25. The fundamental qualification of a teacher has been most aptly described as follows in the calendar of the Massachusetts Institute of Technology.

> " He who is still a student, who is still himself learning, whether it be new relationships of the more fundamental scientific nature, or sounder and more economical ways of applying scientific knowledge for the promotion of industry and public welfare, can best guide those about to enter upon the professional career."

As far as I know, every advanced country in the world lays stress on this qualification, particularly when considering the appointments to senior teaching posts. The deciding factor in these appointments is not degrees or experience, but evidence of continued studentship and learning, i.e., research, a tangible form of which is original publications. The Director has emphasised this qualification in his Proc.Rc.No.4362 C-1/47-1 dated 4th October 1947 and has made it a criterion for promotion of the staff of the College.

26. I submit that Mr.Srinivasan does possess this fundamental qualification for a senior teacher. He has been engaged in research and in guiding research students since 1937 and has made original contributions to knowledge which should be considered to be of a high order. It is on this ground, rather than on the grounds of his double Master of Science Degree (Madras and Illinois Institute of Technology) and his responsible teaching ex-

experience, that Mr.Srinivasan has the strongest claim for appointment as Professor and, it is on this ground that I recommend his appointment as Professor, of Electrical Engineering of the Coimbatore College.

27. The Anantapur Engineering College is now in the process of shifting to Anantapur. It will have three classes:- first year, second year and third year, from July 1948, and it must have a Professor of Electrical Engineering as well as Professors in other branches of Engineering which the College will have. I have already submitted proposals in this connection, but orders of the Government have not yet been passed.

28. I do not think that it will satisfy Mr.Srinivasan or prevent the demoralising action on him and other members of staff of our Engineering Colleges if the direct recruit is appointed as Professor of the Coimbatore College and Mr.Srinivasan is appointed later as Professorof the Anantapur College. If the Government consider Mr.Srinivasan suitable for appointment as Professor of the Anantapur Engineering College and also wish to appoint the direct recruit as Professor at Coimbatore, I would respectfully request that orders creating the post of Professor of Electrical Engineering at the Anantapur Engineering College may be passedimmediately, and that orders appointing the direct recruit and Mr.A.Srinivasan to the two Professorships may be issued simultaneously.

PRINCIPAL.

Encl: Application of Mr.A.Srinivasan.

AIEE
Technical Paper
47-20

December 1946

DYNAMIC BRAKING BY SELF-EXCITATION OF SQUIRREL-CAGE MOTOR

A. Srinivasan
Application Pending

M. A. Thomas
Member AIEE

Illinois Institute of Technology, Chicago, Ill.

New Mexico State College, State College, New Mexico

Advance Copy
Not Released for Publication

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American Institute of Electrical Engineers
33 West 39th Street, New York 18, N.Y.

A paper recommended by the AIEE committee on industrial control devices for presentation at the AIEE winter meeting, New York, N.Y., January 27-31, 1947. Manuscript submitted November 12, 1946; made available for printing December 16, 1946.

PRICE:	BY MAIL	AT HEADQUARTERS OR MEETING
To Members	15¢	10¢
To Nonmembers	25¢	20¢

21a

DYNAMIC BRAKING BY SELF-EXCITATION OF SQUIRREL-CAGE MOTOR

By A. Srinivasan
and
M. A. Thomas

Synopsis: This paper describes a method for calculating the speed-torque curve of a squirrel-cage induction motor when static capacitors are used to produce dynamic braking. The method is simple yet sufficiently accurate for the purpose of selecting equipment for any normal application. The advantages and disadvantages of this method of braking control are compared with those of other methods in use for squirrel-cage motors.

The use of static capacitors to produce self-excitation of an induction machine is well known. A number of engineers have realized that this method could be used for dynamic braking, but little application of the principle has been made. If external resistors are connected in parallel with the capacitors, a very great increase in the braking torque can be produced. There are several advantages to be gained by this scheme of braking. A large part of the kinetic energy of the rotating system is dissipated in the external resistors. Braking torque is independent of any power supply. Part or all of the capacitors required may be used during normal motor operation to improve the power factor. The maintenance of mechanical brakes is reduced to a minimum and complicated switching equipment is eliminated. A major disadvantage is the rapid decrease of braking torque as the speed of the motor decreases. In spite of this fact, there are numerous applications of motor control where a careful study of capacitor braking would seem desirable.

Several papers have appeared in technical journals[1,6] in which mention is made of the capacitor braking scheme. So far as the authors are aware, there is no information available as to how the braking torque of a given motor, capacitor and resistor combination may be predetermined. An attempt has been made in this paper to devise a method for calculating the torque-speed characteristic with a minimum of experimental data concerning the motor. A simple graphical scheme is proposed to determine the operating conditions at any selected speed and an approximate value of braking torque is easily calculated. The results of experimental tests conducted on a standard squirrel-cage motor are shown to agree reasonably well with the theoretical calculations.

COMPARISON OF BRAKING METHODS

At least four methods for applying a braking torque to a squirrel-cage induction motor and its load have been discussed in technical articles dealing with the problem of rapidly bringing the motor and its driven load to a stop.

These methods are:
1. Mechanical brake.
2. Plugging.
3. Application of direct current to the stator.
4. Induction generator action by means of capacitive excitation.

A brief description and comparison of these schemes will be desirable to show the possible field of application of the method to be described in some detail in this paper.

The authors wish to acknowledge with thanks the help of Dr. L. T. Rader, Head of the Department of Electrical Engineering, Illinois Institute of Technology, Chicago, for the suggestion of the problem and for providing all facilities for conducting the experiments in the laboratory.

16 16 21b

The mechanical brake, applied by a spring and released by a solenoid operating in parallel with one phase of the motor, provides the simplest type of braking control. It has the advantage that all of the energy absorbed by the brake is dissipated external to the motor. The motor and load are held in position at standstill and this feature makes the mechanical brake an indispensable part of any braking scheme which must provide holding torque at zero or very low speeds. Applications requiring frequent stopping of loads having considerable kinetic energy are likely to result in excessive wear and maintenance cost on a mechanical braking system. Such applications warrant a study of the several electrical systems to determine if the advantage to be gained will justify the additional cost and circuit complication of the electrical methods.

Plugging of a three phase squirrel-cage motor is accomplished by simply interchanging any two of the supply lines. The surge of current in stator and rotor is somewhat more severe than at starting unless a reduced voltage is provided. For loads having only a small amount of friction torque, the energy which is dissipated as heat in the rotor in braking the load to standstill is nearly three times[8] the kinetic energy of the motor and load. This extreme heating of the rotor would seem to limit the application of plugging of squirrel-cage motors to cases where either low inertia or infrequent stops would make it practical. An additional complication is the necessity of an automatic switch of some kind to remove power at the instant the motor stops, otherwise the motor and load will be quickly brought to full speed in the opposite direction. The magnitude of the braking torque can be controlled only by the application of an adjustable voltage during the braking period.

Application of direct current to one phase of the stator of a squirrel-cage motor will provide a braking torque which can be adjusted quite easily. Heating energy equal to the kinetic energy of the motor and load will be produced in the rotor for applications having a small friction torque. The braking torque will vary with the speed of the motor and in general will follow a characteristic similar to that shown in the diagram of figure (1).

The difficulty of dissipating any great amount of energy either in a mechanical brake or in the rotor of the squirrel-cage motor has led several engineers to investigate the possibility of operating a motor as an induction generator during the braking procedure and thereby make possible the transfer of power from the machine to an external resistor. Considerable study has been made of the operation of an induction machine with self excitation supplied by static condensers.[4] Most of the published information, however, deals with operation at a constant frequency and little has been done on the varying frequency problem of dynamic braking. The self excitation is known to decrease rapidly with decrease in speed of the motor. However, if braking can be accomplished even to one half speed, three fourths of the kinetic energy of the rotating parts will have been dissipated. The application of the method of braking has been handicapped by the fact that no very simple or reliable method has been available for predetermining the speed-torque characteristic which will result from a given motor, capacitor and resistor combination. The purpose of this paper is to describe a method by which this speed-torque characteristic can be calculated with fair accuracy and with a minimum of test data concerning the motor. Typical speed-torque characteristics for the four methods of braking are shown in figure 1. A determination of the speed-time characteristic for any given load requires the additional knowledge of only the WR^2 of the load and motor and the load torque. A general method for solution of this problem is given in several standard text books[2] dealing with motor applications.

CONVENTIONS AND ASSUMPTIONS

The conventional equivalent circuit of the induction motor as shown in figure 2 will be used as the basis of the analysis. The copper loss in the rotor circuit how-

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ever will be neglected and the current-voltage characteristic of the exciting susceptance B will not be assumed a constant but must vary in accordance with the no-load test data for the motor. The particular volt-ampere characteristic for any motor will depend upon the saturation of the iron of that machine. The wave form of the voltage is nearly sinusoidal[3] and little error is introduced by such an assumption. The frequency is assumed to be that determined by speed alone without regard to slip. This will introduce considerable error at low voltages where the generator action is disappearing, but does permit a simple graphical solution for the operating conditions. A more exact method based on a cut and try solution is available[4] if thought necessary. The voltage drop in the primary impedance due to the in-phase component of the current through the load resistor is neglected. The very considerable tolerance in the capacitance of capacitor units makes a simple solution sufficiently accurate for the purpose of specifying the capacitors for a given application.

The assumptions stated above reduce the equivalent circuit to the approximate form shown in figure 3. The symbols have the following meaning:

R_1 = Stator resistance in ohms per phase to neutral

X_1 = Stator leakage reactance in ohms per phase to neutral, at normal frequency.

B = Exciting susceptance.

C = Equivalent capacitance in Farads per phase to neutral.

R = Equivalent resistance of load resistor in ohms per phase to neutral.

The actual values of C and R which are connected line to line (and not line to neutral) are respectively one third and three times their equivalent values as shown in this circuit.

V = Terminal voltage to neutral or by assumption of balanced sinusoidal condition is line voltage divided by $\sqrt{3}$

E = Air gap induced voltage to neutral

I_1 = Primary current per line assumed positive as shown by the arrow.

The curve of figure 4 shows the volt-ampere characteristic of the motor. Data for this curve was obtained by operating the motor at normal speed and without load. A five horsepower, 850 rpm, 220 volt, three phase, 60 cycle squirrel-cage motor was used in the sample calculations and the same motor was used for the experimental checks.

ANALYSIS OF THE PROBLEM

Consider first the approximate circuit of Figure 3 without the braking resistor. The current I_1 will lead the voltage V by 90° since it is merely the current taken by the capacitor C. The current taken by the motor when running idle with voltage V applied will be near this same current. The voltage E may be expressed as

$$E = V + I_1 (R_1 + jX_1)$$

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as shown in the vector diagram of figure 5

$$E = V - I_1 X_1$$

since the component $I_1 R_1$ is at right angles to V and contributes little to the magnitude of E.

In general the air gap induced voltage is a function of flux and speed.

$$E = f(\phi, N)$$

where ϕ and N are flux and speed respectively. Then

$$\phi = g\ (E/N)$$

The no load current I_n depends on the flux and hence

$$I_n = h\ (E/N).$$

Since

$$V = E + I_1 X_1 \text{ (numerical addition)}$$

then we may say that

$$I_n = F\ (V/N)$$

Either air gap voltage or terminal voltage from test data may be plotted against no-load amperes to represent the relation given above. In figure 6 is shown the curve plotted from data taken on the five horsepower motor.

Data taken with capacitive excitation at various speeds checked very accurately with that taken from the usual no-load motor test. The current through the capacitor is

$$I_c = V\ 2\pi\ f\ C$$

But

$$f = \frac{P}{120} N (1 - S)$$

In the analysis if slip S is neglected

$$I_c = \frac{V}{N} \frac{2\pi\ P\ N^2\ C}{120} \text{ where P = No. of poles}$$

For a given value of speed N and capacitor C this is an equation of a straight line and may be drawn on the plot of Figure 6. The intersection of the curve and straight line will give the no-load operating condition of current and voltage for this speed. Several lines with different slopes representing different speeds or capacitances may easily be drawn. The slope of the line for a fixed capacitance is seen to vary with the square of the speed.

The power absorbed by the machine from the kinetic energy may now be calculated as the sum of the following three parts:

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1. The power to the resistor R. $P_r = 3V^2/R$
2. The power to R_1. $P_{r1} = 3 I_1^2 R_1$
3. The friction, windage and core loss read from the test curve obtained at the same time as the no load saturation curve and shown on Figure 4. P_c

$$P_{Total} = P_r + P_{r1} + P_c$$

The retarding torque then is obtained from the usual equation

$$T = \frac{7.04 \times P_{Total}}{N} \text{ lb. ft}$$

The deceleration time is a function of the WR^2 of the motor and driven machines and is also dependent on any friction load which may be present.

A TYPICAL EXAMPLE

The no-load characteristic of a 5 horsepower 8 pole, 60 cycle, 220 volt, 3 phase squirrel-cage induction motor as obtained from tests is given in Figure 4. The resistance per phase of this motor is 0.375 ohms at 65°C. A calculation of the torque developed with a capacitance of 200 microfarads and a resistance of 120 ohms per phase connected in delta across the lines will be made. The equivalent C and R in the line to neutral circuit of Figure 3 are 600 microfarads and 40 ohms respectively. The current in the capacitor is given by

$$I_c = \frac{V}{N} \cdot \frac{2\pi P N^2 C}{120} = \left(\frac{V}{N}\right) \times N^2 \left(\frac{2\pi \times 8 \times 600 \times 10^{-6}}{120}\right)$$

For N = 900 RPM this reduces to

$$I_c = 203\left(\frac{V}{N}\right)$$

This straight line is then plotted on Figure 6 and intersects the curve at V/N = .230 and I_c = 46.5. The voltage to neutral then is V = .230 x 900 = 206 volts, or 350 volts line to line. The several power components are

$$P_r = 3 \times \frac{206^2}{40} = 3190 \text{ watts}$$

$$P_{r1} = 3 \times 46.5^2 \times .375 = 2430 \text{ Watts}$$

From Fig. 4, for a line to line voltage of 350, P_c = 2200 watts

$$P_{Total} = P_r + P_{r1} + P_c = 7820 \text{ Watts}$$

The retarding torque

$$T = \frac{7.04 \times 7820}{900} = 61.2 \text{ lb. ft}$$

In a similar way, the torques for speeds of 800, 700, 600 rpm are obtained. The speed

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at which braking action ceases can be determined by drawing the tangent to the curve in Figure 6. From the slope of the line this speed was found to be 465 RPM. This is the critical speed for the capacitance chosen. The values of torque, voltage and current for the different speeds are plotted in Figure 7.

An experimental check was made by driving the motor at the different speeds by means of a direct current dynamometer. At speeds above the critical speed, the machine rapidly built up voltage when connected to the capacitor-resistor combination. Values of torque, voltage and current were obtained for each speed. The experimental values are shown by small crosses on the plot of Figure 7, as can be seen, the agreement is satisfactory in most cases.

SOLUTION FOR SPEED TIME RELATION

The net friction or overhauling torque of the load as a function of speed and the total WR^2 of the rotating system must be known. Then with the braking torque obtained above the net retarding torque T_r will be,

$$T_r = T \pm T_L$$

where T_L is the torque produced at the shaft of the motor by the driven machine. T_r will be represented by a curve and in general will be a function of speed alone. The usual equation relating T_r and time is

$$\text{(Average)} \quad T_r = \frac{WR^2 N}{307.8 (t)}$$

where N is the change in speed occurring in t seconds. In better form

$$T_r = \frac{WR^2}{307.8} \frac{dN}{dt}$$

expresses the torque as a function of the rate of change of speed.

Solving the above equation for time t,

$$t = \frac{WR^2}{307.8} \int_{N_1}^{N} \left(\frac{1}{T}\right) dN$$

As outlined in reference 2 the integration can be made by a graphic tabular process to obtain the time t for speed to change from N_1 to any other value N.

Conclusions: The capacitor braking scheme has many desirable features for dynamic braking of squirrel-cage induction motors. Although the braking action does not persist till the motor stops, it does dissipate the greater part of the kinetic energy of the rotating system. The analysis proposed in this paper will permit satisfactory prediction of the speed-torque characteristic of any proposed motor and capacitor combination. From the test results it appears that capacitors having a KVA rating of about three times the exciting KVA of the motor will produce an initial retarding torque of double the full load torque. The current and the voltage developed by self-excitation are considerably above the rated values for the motor. The speed, however, is rapidly reduced by this large torque and no damage should result to the motor or associated equipment. A part or perhaps all of the capacitors needed can be used for power factor correction during normal running of the motor.

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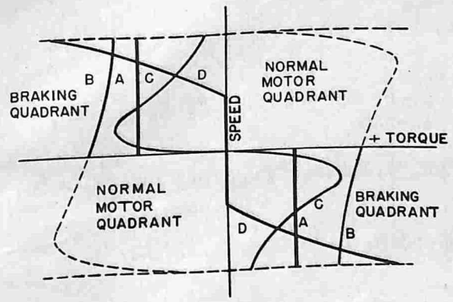


Fig. 1 Typical Speed-Torque Characteristics for Several Types of Braking Control.
(A) Mechanical Brake
(B) Plugging
(C) D.C. Applied to Stator
(D) Capacitive Braking

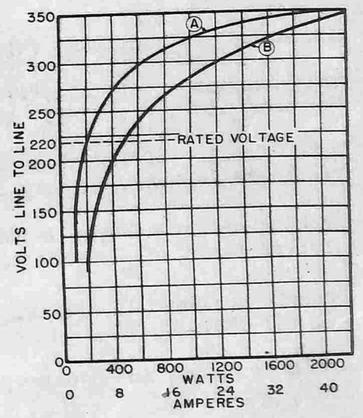


Fig. 4 No-load Characteristics of Induction Motor
(A) is the curve connecting the total no-load watts and line-to-line volts.
(B) is the curve connecting the line current and the line-to-line volts.

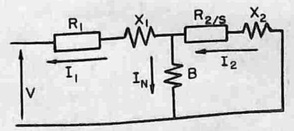


Fig. 2 Equivalent Circuit of an Induction Motor

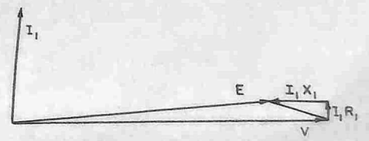


Fig. 5 Vector diagram of Induction Machine at No-Load.

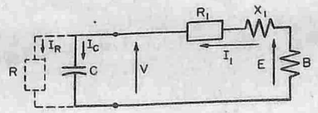


Fig. 3 Approximate Equivalent Circuit for the Determination of Operating Conditions

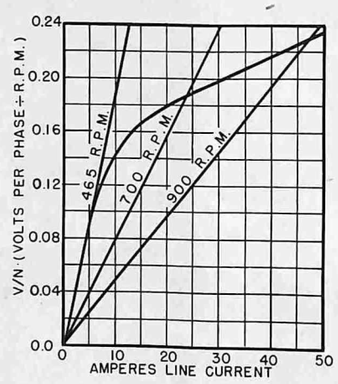


Fig. 6 Graphical Construction for Operating Conditions at Various Speeds

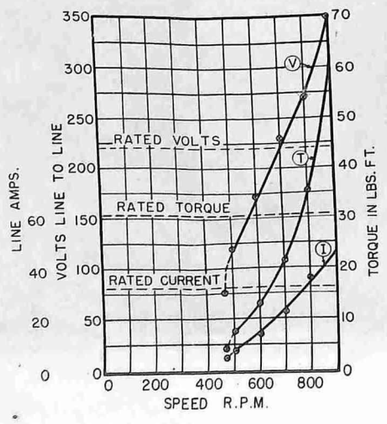


Fig. 7 Predetermined Characteristics and Experimental Verification. Firm Lines indicate the Calculated Characterisitcs. Dotted lines Indicate the Region of Instability. ⊘ Indicate Test Results. (V) is the curve of line volts, (T) is the curve of torque and (I) is the line current.

AIEE
Technical Paper
47-255

September 1947
Litho in USA

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TRANSIENT VOLTAGE RISE IN TRANSFORMERS DUE TO INTERRUPTION OF EXCITING CURRENT

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American Institute of Electrical Engineers
33 West 39th Street, New York 18, N.Y.

A paper recommended by the AIEE Committee on transformers for presentation at the AIEE Midwest general meeting, Chicago, Ill., November 3-7, 1947. Manuscript submitted August 14, 1947; made available for printing September 24, 1947.

PRICE:	*BY MAIL*	*AT HEADQUARTERS OR MEETING*
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TRANSIENT VOLTAGE RISE IN TRANSFORMERS DUE TO INTERRUPTION OF EXCITING CURRENT

Introduction:

The transformer designer should be interested in the types and origin of transient overvoltages in systems so that he can properly insulate the machines which he designs. This information is not entirely complete even today, but designers either follow their own theories or follow empirical rules. In earlier days, neither the magnitude of surges nor the strength required to meet them were known. Efforts to make design less empirical are required.

More recently, the magnitude of switching surges, and their origin, has been the subject of many papers and much discussion, particularly on their effect on breakers. Studies of voltage recovery rates to prevent voltage restriking in breakers, lightning protector tubes and other devices have been made. One very important source of over voltages, that of sudden interruption of magnetizing currents of transformers, has not been given the detailed study it deserved because this possibility was not given due consideration. In this paper, it is shown that some circuit breakers can interrupt transformer magnetizing currents at any point in the current wave, and that severe overpotentials can then exist. Interruption does not always occur on current zero.

Calculations have been made in this paper to see exactly the source of the voltages and if they checked experimental observation. It was found that a reasonable agreement existed, and that, since the surge was initiated in the iron circuit, that the voltage would be nearly uniformly distributed in the winding. The conclusion can be reached therefore that this type of switching surge would not lead to concentrations of voltage stress in the windings, except in case of terminal flashover.

The above considerations are of importance in circuits where magnetizing currents are interrupted as in furnace transformer circuits, and special apparatus used intermittently. They are also important in considering the possibility of local resonance in transformer windings with switching surges, which in this particular case would not seem possible.

General Procedure of the Investigation:

The following procedure was adopted for this analysis. First a number of oscillograms were taken from a three-phase transformer installation where the design data was available. A study was made of the time in the cycle at which the circuit was interrupted in relation to the exciting current, the magnitude of the voltage rise and the time within which the rise took place after the interruption. Second, with a knowledge of the magnetic properties of the iron core obtained from a steel data book[3], the energy stored in the iron core was calculated. The instantaneous energy of all the three phases was calculated and from that, the instant at which the total energy was a maximum, was determined. It is this total energy which is available to create voltage surges. Third, the transformer installation was reduced to a simple equivalent circuit consisting of inductance and capacitance. The inductance was calculated from the exciting current, and the capacitances were calculated assuming them to be lumped capacitances. From the simplified circuit, the natural frequency was calculated. Fourth, assuming that the time taken for the surge to reach its crest value is a quarter period of the natural frequency, the energy which was dissipated as eddy current loss was calculated. Fifth, the balance of the stored energy obtained after supplying the eddy current loss was considered to charge the capacitances such that $W_c = 1/2\ CE^2$ in appropriate units.

Description of Transformer Installation:

The analysis was done on a transformer installation with three delta-delta connected single-phase units rated as follows:

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HV, 3000 volts, 60 cycles, air-cooled.
Net area of cross-section of the core = 24.6 sq. inches.
Flux density in the core = 11400 Gauss.

Laminations used were equivalent to U.S.S. 52, grade 0.014 inches thick.

The high voltage winding consisted of 674 turns wound in four layers per coil, each layer having 84 and 84-1/2 turns, wound as rectangular coils. The insulation between layers #1 and 2 and between layers #3 and 4 was three layers of 0.010 inch mica. The insulation between layers #2 and 3 was 3 layers of 0.010 inch mica and 3/8 inch duct. The insulation between the high and low voltage windings was 5 layers of 0.010 inch mica and 3/8" duct.

Mean length of the iron circuit = 63 inches.
Volume of the iron = 1560 C. inches.
Wt. of iron = $\frac{1560}{3.69}$ = 423 lbs. approx.

Study of the Oscillograms:

A number of oscillograms taken when the exciting current was interrupted were studied. Figure (1) shows a typical voltage surge obtained from one of the oscillograms. The following are the observations made from the study of the oscillograms.

(1) The circuit could be interrupted at any instant on the cycle. The oscillograms were taken on all the phases when the circuit was interrupted. The instant at which the voltage surge occurred in each of the phases was determined from the oscillograms of the respective phase. The interruption having taken place simultaneously in all the phases, the instant at which this happened was plotted with reference to the flux density in each phase. Thus, in Figure 2, the flux density is plotted assuming that it varies sinusoidally with time. Only one half cycle is shown. The magnitude of the surge voltage is also plotted against the same base of time. Therefore, the plot shows that the maximum voltage was produced in each phase when the flux density was a maximum. The numbers 41, 42, etc., on the figure are the results obtained from tests #41, 42, etc. Table 1 gives the time of interruption and the magnitude of the surge voltage.

(2) The maximum surge voltage occurred when the exciting current was nearly a maximum at the time of interruption. The maximum voltage exceeded 4-1/2 times the normal voltage to ground.

(3) The crest of the surge was reached in $\frac{1}{1600}$ second; the voltage dropped from its crest to zero very rapidly, with little oscillation. This would be the equivalent of a quarter period of a 400-cycle wave.

Energy in the Magnetic Field:

The existence of a magnetic field indicates a storage of energy, and the energy required to change the induction density from the value B_1 to B_2 is given by the expression

$$= \frac{1}{4\pi} \int_{B_1}^{B_2} H.dB$$ in appropriate units from unit volume of the iron.

If a magnetization curve be drawn as in Figure 3, a magnetizing force OB is required to produce a flux density Ob. If the magnetic field is allowed to collapse by the interruption of the exciting current, it will be reduced to a residual field equal to OC. The average energy required to obtain a flux density Ob is proportional to the area of the portion OABbO. When the field collapses, the path of the flux is along BC due to the hysteresis of the iron. Hence the energy corresponding to the area BbCB only will be available for transfer.

The total energy in the entire bank of transformers is due to all the three phases. Since the exciting currents in the three phases are out of phase with each other by 120°, the maximum energy in each phase will differ by 60°. The instantaneous energy per unit volume of the iron is $= B^2/8\pi\mu$ .in appropriate units. The values of B and μ are both changing and hence the energy has to be computed point by point, and they are tabulated in Table 2. Figure 4 shows the magnetizing force at various instants. Figure 5 shows the energy stored in each of the three phases plotted against time and also the sum of the instantaneous energies for all three phases. From the figure it appears that in the region of time interval between 60° and 90° the total energy is a maximum. However, at the instant corresponding to 90°, two phases have equal energies and the third phase contributes a small amount of energy. Hence it could be assumed to simplify calculations that at the instant when the total energy is a maximum, two phases have equal energies and the third phase has no energy. If the circuit is interrupted at that instant, the magnetizing force of one transformer will be increasing while that of the other is decreasing. Therefore, the flux density of the increasing phase would be OF and that of the decreasing phase would be OE in Figure 3.

The energy stored and available for transfer in the magnetic fields of the two phases is different since it is proportional to the area enclosed between the hysteresis loop and the Y-co-ordinate axis. Thus, if the circuit was interrupted at the point D, (Fig. 3) the magnetic field would collapse along the curve descending from D to C. The energy given up due to this collapse is given by the area DECD. At the same time the other phase was interrupted at G when the magnetizing force was increasing. After the interruption, its magnetic field would collapse following the curve GH. The energy given up by this transformer is proportional to the area GFHG.

The available energy in joules per cubic inch of iron is equal to the two areas. The co-ordinates of which kilo-lines per square inch and ampere-turns per inch. Thus the area of CDEC from Figure 3 is 5.45 sq. in. and of HGFH is 3.25 sq. inch. The scale for Figure 3 is 1 inch for 1.33 ampere-turns per inch and 1 inch for 10 kilo-lines per square inch. The energy available is $(5.45 + 3.25)\ 1.33 \times 10^{-4} \times 1560$ or 1.81 joules for these two phases.

Determination of the Capacitance:

Since the copper of the transformer windings is separated from the core by means of insulation, there is a capacitance between the windings and the core. At the same time, there are capacitances between the several layers of the windings and also between the turns themselves. The inter-turn capacitances are themselves small, and being in series with one another, can be neglected. The inter-layer capacitances are calculated considering that the layer is similar to a plate of a condenser. The several turns in each layer being in series, there is a potential gradient along the length of the layer. At the end of the layer where the connection is made to the next layer, the potential difference between the layers is zero and is twice the voltage per layer at the other end. Therefore the electro-static flux distribution varies uniformly above the length of the layer. However, it is assumed as an approximation that the effective capacitance between two layers is half the capacitance between the layers considered as plates.

Neglecting the effects of fringing and other irregularities in the flux distribution, the capacitance is calculated from the formula C in M.M. fds $= \frac{0.22 \times A \times K}{d}$ inch-units. Therefore the effective capacitance between any two layers $= \frac{0.11 \times A \times K}{d}$ m.m. fds.

Thus the capacitance between layers #1 and 2 is $C_{12} = \frac{0.11 \times 681 \times 6}{3 \times 0.01} = 1.5 \times 10^4$ m.m.fd. Similarly the capacitance between layers #2 and 3 is $C_{23} = 0.1 \times 10$ m.m.fd. and the capacitance between layers #3 and 4 is $C_{34} = 1.65 \times 10$ m.m.fd.

The low voltage winding is assumed to be at ground potential for the following reasons: The voltage of the L.V. winding being very small, the energy required to charge

its capacitance is negligible and its voltage to ground is also negligible when compared to the H.V. winding.

Considering the capacitance C_g between the H.V. winding and ground, it would be very nearly the same as that obtained in the case of a plate condenser.

Thus $C_g = 0.036 \times 10^4$ m.m.fd.

Thus in Figure 6(a), is shown the arrangement of the different capacitances. The voltage across C_{12}, C_{23} and C_{34} of each leg is 1/4 of the voltage across the entire winding on both legs. If C is the effective equivalent capacity between the four layers in each leg, then on the basis of energy considerations,

$$C\left(\frac{E}{2}\right)^2 = C_{12}\left(\frac{E}{4}\right)^2 + C_{23}\left(\frac{E}{4}\right)^2 + C_{34}\left(\frac{E}{4}\right)^2$$

$$\therefore\ C = \frac{1}{4}\left(C_{12} + C_{23} + C_{34}\right)$$

$$= 0.81 \times 10^4 \text{ m.m.fd.}$$

Figures 6(b) and 6(c) are derived from 6(a) by combining the two capacitances C_g and replacing C_{12}, C_{23} and C_{34} by C. Figure 6(d) isthe equivalent circuit diagram for the delta-connected transformer.

Under the conditions when there was maximum energy, it was found that two phases were nearly identical and that the third phase did not contribute appreciable energy to the circuit. Then the two phases may be considered to act in parallel and thus Figure 6(e) was obtained. Figures 6(f) and 6(g) and 6(h) are successive developments of the equivalent circuit leading to the final form in Figure 6(i), where there is only one inductance connected in parallel with one capacitance C_e. Forthis case $C_e = (3.24 + .048)$m.m.fd. or 0.0329 m.fd.

Determination of the Frequency:

The inductance of the circuit is not constant since the magnetisation curve is not a straight line. However, for the case under examination, it was found ffom the several oscillograms taken that the frequency was about 400 cycles per second and this value was taken to be the surge frequency for the calculation of the eddy current losses. It is of interest to attempt its calculation and the following approximate method was used.

The r.m.s. value of the exciting ampere-turns was obtained from Figure 3. The maximum flux density was 73000 lines per sq. inch. Thus the ampere-turns per inch at this flux density is about 0.5 and the r.m.s. value would be $\frac{6.5}{\sqrt{2}} = 4.6$; hence the exciting current $= \frac{4.6 \times 63}{3000} = 0.43$ amps. The exciting inductance of each transformer would be $\frac{674}{0.43 \times 377} = 18.6$ henries.

The equivalent inductance shown in Figure 5(i) is the resultant of two transformers in parallel. Therefore the equivalent inductance in parallel with the capacitance to produce oscillations is one-fourth of the total inductance of two transformers in parallel or one-eighth of the exciting inductance of each transformer. Therefore the equivalent inductance is parallel with C_e is $\frac{18.6}{6} = 2.325$ henries. The natural frequency of this L-C circuit would be $f_o = \frac{6}{2\pi}\frac{1}{\sqrt{1C}}\ \frac{1}{2\pi\sqrt{2.325 \times .0329 \times 10^{-6}}} = 575$ cycles per sec.

Determination of the Losses:

The losses in the core depend upon the frequency and the flux density. Since both

these are variable, the true representation of losses as an equivalent resistance is complicated. However, the losses can be estimated separately as eddy current and hysteresis losses and this appears to be the simplest procedure. The hysteresis loss has already been taken into account when the areas HCFH and CDEC were obtained. Hence the eddy current loss only has to be calculated.

Whenever magnetic flux is changing in a core, there is an induced e.m.f. in the core material. This e.m.f. sets up the circulating eddy currents and losses. The frequency in this case is the natural frequency set up by the inductance and capacitance in parallel. Since the inductance of the circuit changes rapidly as the energy stored in it is dissipated, the frequency of oscillation also changes. However, as an approximation it was assumed that during the 1/4 cycle while the surge crest is being reached, the frequency does not change appreciably. The frequency as measured from the oscillograms was 400 cycles.

The flux in the core drops down such that the residual flux density is reached in a quarter period of the natural oscillation. The instantaneous eddy current loss per unit volume of the core is $\frac{t^2}{12\rho}(\frac{dB}{dt})^2$ in appropriate units. The change in flux density is the difference between the flux density at the time of interruption and the residual flux density, and it is assumed to vary sinusoidally. Therefore the average eddy current loss per unit volume is

$$= \frac{\pi^2 f^2 t^2 B^2}{6\rho} \text{ in appropriate units.}$$

The natural frequency was 400 cycles per second. t = 0.014 in. Specific resistivity ρ = 25.6 microhms per inch cube. At the time of interruption, the flux density in one transformer was 69 x 10^3 lines per sq. inch and it decayed to 27.5 x 10^3 lines per sq. inch. The change of flux density B was 41.5 x 10^3 lines per square inch.

The eddy current loss in the first transformer was $p_{el} = \frac{\pi^2 x 400^2 x 0.014^2 x 41.5^2 x 10^6}{6 x 10^{16} x 25.6 x 10^{-6}}$

= 0.347 watts per cubic inch.

The second transformer has a change of flux from 59.5 x 10^3 lines per sq. inch to 24.5 x 10^3 lines per sq. inch. Thus the change of flux density was 35 x 10^3 lines per sq. inch. The eddy current loss in the second transformer was $P_{e2} = \frac{\pi^2 x 400^2 x 0.014^2 x 35^2 x 10^6}{6 x 10^{16} x 25.6 x 10^{-6}}$

= 0.246 watts per cubic inch.

The energy lost in both the transformers as eddy current loss in 1/4 cycle or $\frac{1}{1600}$ second was $W_e = \frac{(0.347+0.246)1560}{4 \times 400} = 0.579$ joules.

Energy to Charge the Capacitances:

Out of the total energy W_T available in the magnetic circuit, the energy W_e is spent as eddy current loss and the balance $W_T - W_e = W_c$ is the energy available to charge the capacitances. The energy required to charge a capacitance C to a potential E is $W_c = \frac{1}{2} CE^2$, whence $E = \sqrt{\frac{2W_c}{C}}$

The total energy available from the magnetic circuit was W_T = 1.81 joules. The energy spent as eddy current loss was 0.579 joules. Hence the energy available to charge the capacitance C_e would be 1.81 - 0.579 = 1.231 joules. The effective capacitance C_e was calculated to be 0.0329 mfd.

Therefore $E = \sqrt{\frac{2 \times 1.231 \times 10^6}{0.0329}} = 8650$ volts.

From Figure 6 (j) it can be seen that the potential of one transformer was $\frac{4}{3}$ x 8.65 = 11.53 kv. The normal voltage to ground was $\frac{3000 \times \sqrt{2}}{\sqrt{3}} = 2450$ (crest). Therefore the

ratio $\frac{\text{Crest value of surge volts against ground}}{\text{Crest value of normal volts against ground}} = \frac{11.53}{2.45} = 4.7$

The oscillograms shows that this ratio is about 4.5. This slight discrepancy is due to the several approximations made in the calculation and also because the result is a difference between two relatively large quantities. However, the agreement is close enough to indicate that the general explanation is correct.

The case analyzed is not the worst condition, and more severe conditions can occur due to the following reason. The analysis was done on the assumption that at the instant the circuit was interrupted, the exciting current was in a steady state. If however, the interruption took place when there was an in-rush current, the magnitude of the surge voltage would be larger. The magnitude of the in-rush current would be several times the normal exciting current and consequently there would be an increase in the magnetizing force. A larger magnetizing force would produce a larger amount of stored energy in the core. Though the energy does not increase proportionately with the magnetizing current due to saturation, yet the consequent rise in voltage may be higher than that obtained under steady state conditions.

The voltages as high as seven times normal instead of 4-1/2 were obtained under these conditions. With the secondary loaded, the switching surge would not produce as high a voltage, because a portion of the energy would be dissipated in the load.

Conclusions:

The interruption of the exciting current in a transformer or any iron-cored circuits produces a transient rise in voltage. Such cases often happen in practice, especially in arc furnace transformers. The magnitude of this voltage can be several times the normal voltage against ground and unless adequate insulation is provided, it may cause a failure of the insulation. The method outlined in this paper is simple and a fairly close approximate calculation of the rise in voltage may be made by means of this method.

Since the rise in voltage is fixed by the effective capacitance, it appears that the smaller the capacitance, the greater will be the voltage rise. Hence, a set of external capacitances connected to the terminals of the transformers will increase the effective capacitance and thereby reduce the voltage rise.

Since the voltage rise is caused by the change of flux in the iron, it should result in a uniform voltage distribution through the winding. Most switching surges result from flux linking windings and hence, the conclusion may be reached that switching surges are likely to be uniformly distributed in windings.

Acknowledgments:

Acknowledgment is made to the Allis-Chalmers Mfg. Co. and their engineers for the test data and oscillograms. Also acknowledgment is made to Mr. J. B. Hodtum for his conception of placing the voltages obtained by switching on the same diagram with the flux in Figure 2.

22-8

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3. U.S.S. Electrical Steel Sheets, Technical and Descriptive Bulletin Number 2.

4. H. C. Roters, Electromagnetic Devices (book) John Wiley & Sons, 1941.

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TABLE I.

MAGNITUDE OF THE SURGE VOLTAGE AT VARIOUS INSTANTS OF INTERRUPTION

Test No.	Phase	Time of Interruption	Voltage to Ground Times Normal
41	A	40°	1.8
41	C	90°	4.5
42	A	45°	2.0
43	C	90°	4.65
44	A	117°	2.9
44	C	60°	3.25
45	A	152°	1.5
45	C	50°	2.5

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TABLE II

ENERGY IN THE IRON AT DIFFERENT INSTANTS

Time (degrees)	Flux Density B, Kilo-Gauss	Permeability	Energy per c.c. $B^2/8\pi\mu$	Energy in Joules per c. inch
0	-	-	-	-
30	4.65	7000	122	2×10^{-4}
60	7.0	5300	366	6×10^{-4}
90	8.9	4300	732	12×10^{-4}
120	10.8	4240	1098	18×10^{-4}
130	11.3	4200	1220	20×10^{-4}
150	10.4	6000	732	12×10^{-4}
180	0	0	0	0

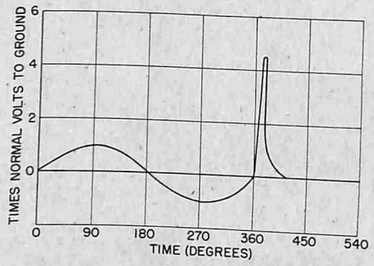


FIG. 1 OSCILLOGRAM OF THE SURGE VOLTAGE.

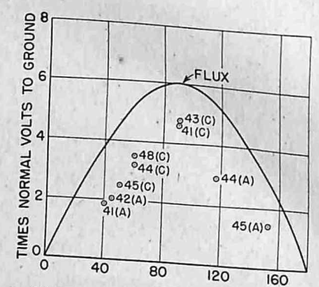


FIG. 2 MAGNITUDE OF THE SURGE VOLTAGE AT DIFFERENT INSTANTS OF INTERRUPTION.

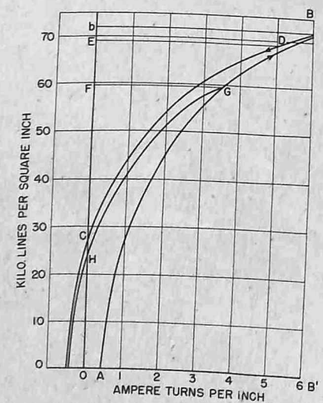


FIG. 3 MAGNETIZATION CURVE OF IRON.

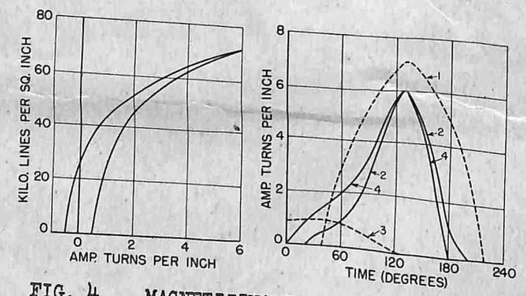


FIG. 4 MAGNETIZING FORCE AT DIFFERENT INSTANTS OF TIME.

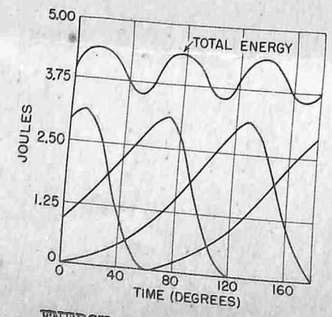


FIG. 5 ENERGY IN THE MAGNETIC FIELD.

FIGURE 6(a)

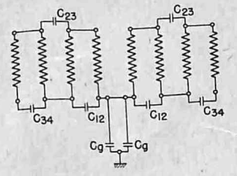


FIGURE 6(b)

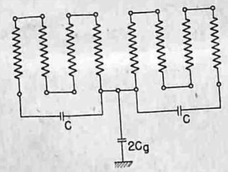


FIGURE 6(c)

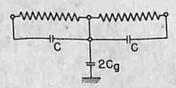


FIGURE 6(d)

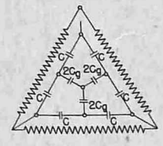


FIGURE 6(e)

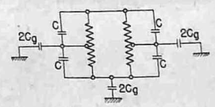


FIGURE 6(f)

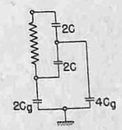


FIGURE 6(g)

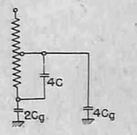


FIGURE 6(h)

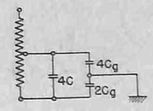


FIGURE 6(i)

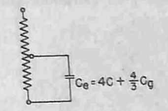


FIGURE 6(j)

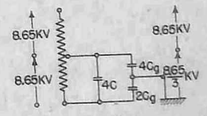


FIG. 6 EQUIVALENT CIRCUIT OF THE TRANSFORMERS.

OFFICE OF THE DIRECTOR OF PUBLIC INSTRUCTION, M A D R A S.
Cl. No.47/47 dated 27th April 1 9 4 8.

Sub: MADRAS EDUCATIONAL SERVICE - Sri A. Srinivasan - Permanent Laboratory Assistant - Posting on return from study leave abroad - Request for appointment as Professor - Petition submitted.

Ref: 1. Petition dated 29th March 1948 from Sri A. Srinivasan, Permanent Electrical Laboratory Assistant, College of Engineering, Guindy.
2. Letter R.C.No.14 A/48 dated 3rd April 1948 from the Principal, College of Engineering, Guindy.

S u b m i t t e d.

2. In their order Ms.No.802 Education dated 6th April 1948, the Government have appointed Sri R.C. Advani, a Sind Refugee, as Professor of Electrical Engineering, Arthur Hope College of Technology, Coimbatore, on a contract basis for a period of three years with effect from date of taking charge. He is expected to join duty during May 1948. Sri A. Srinivasan, the petitioner, has been appointed as Officiating Instructor in Electrical Engineering, College of Engineering, Guindy, in the above Government order.

3. The petitioner is a permanent Electrical Laboratory Assistant in the Madras Edl. Subordinate Service and a regular probationer in the category of Junior Instructor in Electrical Engineering in the Madras Edl. Service. Ordinarily, the next higher category to which Sri A. Srinivasan can be considered is the category of Instructors. He was promoted as a Junior Instructor only on 24th September 1945 and was reverted on 6th October 1945 - in less than a fortnight though but for his deputation he would have been again promoted on 17th December 1945. When he has not completed his probation yet even as a Junior Instructor and has hardly any right to expect promotion even to the next higher category, viz., that of Instructors, the claim for promotion to the category of Professor (from a salary of Rs.260/- per mensem to Rs.600/- per mensem) is quite premature.

4. It may be pointed out that Sri R.C. Advani has been appointed as Professor on the scale of Rs.500-50-700 which is lower than the existing scale of pay applicable to posts of Professors, viz., Rs.600-75/2-900. The appointment of Mr. Advani is a special case which has been made now on a contract basis in the public interests, as otherwise it would be difficult to secure a suitable candidate for appointment as Professor when a new post is created sometime during the ensuing academic year. In the above circumstances, the petitioner has no legitimate grievance against the appointment of Mr. Advani, which has been ordered by Government having regard to public interests.

5. As regards the remarks contained in paragraphs 28 of the letter from the Principal, College of Engineering, Guindy, the creation of the new post of Professor for the Anantapur College of Engineering should be justified on grounds of public interest rather than grounds of personal interest, providing scope for promotion to Sri A. Srinivasan. Proposals for the creation of new posts for the Anantapur College of Engineering are separately under consideration and necessary recommendation will be submitted to Government shortly.

for Director of Public Instruction.

To the Secretary to Government, Edn., and Public Health Department.

"Confidential"

ASST. SECRETARY TO GOVERNMENT
22 JUL 1948
EDUCATION AND PUBLIC HEALTH DEPT.

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27

EDUCATION DEPARTMENT.

From

D.S. REDDI, ESQ., M.A.(Oxon.),
Director of Public Instruction,
Madras.

7489

To

The Secretary to Government,
Education and Public Health Department,
Madras.

R.CL. No. 61 /48, Dated 21st of July, 1948.

Sir,

Subject:- Madras Educational Service - Post of Professor of Electrical Engineering, College of Engineering - Anantapur - Vacancy - Filling of:

(not yet up - but fact verified) ***

IN their Order No. Ms. 1726 Education, dated 9th July 1948 the Government have sanctioned the employment of a Professor of Electrical Engineering in the College of Engineering, Anantapur, for a period of two years from the date of employment. There is at present no Instructor in Electrical Engineering in the Madras Educational Service who is eligible for regular promotion to the post in question. Hence an appointment to the post of Professor of Electrical Engineering in the Anantapur College of Engineering has to be made under emergency provisions. The names of the following Officers have to be considered.

1. F/O A.R. Ramanathan, B.E.
   Probationer in the post of Junior Instructor in Electrical Engineering in the Madras Educational Service, now on other duty in the Civil Aviation Directorate under the Government of India.

2. Sri A. Srinivasan: B.E., M.Sc.(Madras), M.S.(Illinois), A.M.I.E.,
   Probationer in the post of Junior Instructor in Electrical Engineering in the Madras Educational Service, now officiating as Instructor in Electrical Engineering, College of Engineering, Guindy, under emergency provisions.

Sri A.R. Ramanathan, who is now on other duty in the Civil Aviation Directorate under the Government of India is not likely to be available

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2.

available for appointment as Professor in the Madras Educational Service.--Vide G.O. Ms. No. 2652 Edn., dated 12th December 1947. I recommend that Sri A. Srinivasan, Officiating Instructor in Electrical Engineering, College of Engineering, Guindy, may be appointed to officiate as Professor of Electrical Engineering, College of Engineering, Anantapur, temporarily, under Rule 31(a) of the General Rules for the Madras Provincial & Subordinate Services.

2. In this connection I invite the attention of Government to paragraph 3 of my Endorsement CL. No. 47/47, dated 27-4-1948 wherein I have stated that the claims of Sri A. Srinivasan for promotion to the category of Professor is quite premature. One post of Professor of Electrical Engineering was reserved for being filled by direct recruitment of a candidate with War Service. But the Public Service Commission could not select a suitable candidate for the post as none of the two candidates who were subjected to a competitive examination by the Commission obtained qualifying marks for selection.--Vide letter No. 5709 H.1/46-6, dated 25th November 1947 from the Secretary, Public Service Commission, addressed to the Secretary to the Government of Madras, Education and Public Health Department (copy furnished to me with Government Memorandum No.27296 A Edn., dated 7-1-1948). As the normal procedure to be adopted for filling the above 'reserved' vacancy is to advertise it for ordinary direct recruitment I request that the Government may be pleased to take steps to recruit a candidate in the ordinary way. I shall include this vacancy in the Estimate of Vacancies to be filled by Direct Recruitment during 1949, while submitting my proposals next month.

Yours faithfully,

NB/19-7.

DIRECTOR OF PUBLIC INSTRUCTION.

A copy is sent direct to avoid delay.
This is submitted through proper channel.

This application form is not to be used for any post other than that in connection with which it is supplied.

FEDERAL PUBLIC SERVICE COMMISSION

Form of application for the use of candidates for appointment by Selection.

To be returned to the Secretary, Federal Public Service Commission, so as to arrive not later than 29-7-1948

A treasury receipt for Rs. 7-8-0 must be forwarded with this application. An application not accompanied by a treasury receipt will not be considered.

Appointments are made by Government and not by the Commission.

1. Name in full (in BLOCK capitals) APPASWAMI . SRINIVASAN.

2. Address† STAFF QUARTERS. COLLEGE OF ENGINEERING, GUINDY SAIDAPET. P.O. MADRAS.

3. Post for which you are a candidate. ASST. EDUCATIONAL ADVISER (TECHNICAL)

4. Date of birth. 15-10-1908

5. Are you a { British subject ? Yes / Subject of an Indian State ?
*Answer "Yes" or "No" and cancel the words which are not applicable.

6. Name the Province or State to which you belong. MADRAS

7. Father's Name. Mr. V. Appaswami Iyer. (Deceased)
Address* New sheet. Madura.
Occupation* Lawyer.
*If dead state last address and occupation before death.

8. Is (or was) your father* { a British subject ? yes. / a subject of an Indian State ?
*Answer "Yes" or "No" and cancel the words which are not applicable.

9. Name the Province or State to which he belongs or belonged. Madras.

10. Where were you born ? Madura.

11. State your—
(a) Religion— Hinduism
(b) Community— —
(If European or Anglo-Indian, state whether you are or are not of Indian domicile.)
(c) Caste, Sect— Brahmin
‡(If you belong to a Scheduled Caste, give particulars.)

12. Have you been outside India ? If so, give the following particulars :—

Country visited	Date of visit	Duration of visit	Purpose of visit
U.S.A. and (Canada)	Dec. 1945	2 Years	Post-Graduate Study, Research and Training in Industry (On Deputation)
U.K.	Jan. '48	3 weeks	Visit Technical Institutions and Industries
France	Jan. '48	1 week	To meet the Vice-President of the International High-Voltage Conference (C.I.G.R.E.)
Egypt	March '48	1 day	Sight-seeing.

Any change of address given in Col. 2 above should at once be communicated to the Secretary, Federal Public Service Commission. Candidates must arrange for the re-direction of communications to their new addresses, if necessary. The F. P. S. C. make every effort to take account of changes in candidate's addresses but cannot accept any responsibility in this matter.

‡ A claim to be a member of a Scheduled Caste must be supported by a certificate from the District Magistrate.

F.P.S.C. 21.

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13. What languages (including Indian languages) can you read, write or speak? Give particulars, and state the examination or examinations, if any, passed in each.

Read only	Speak only	Read and speak	Read, write and speak	Examination or examinations passed
			Tamil	Inter. Exam.
	Hindi			
German				First Exam.

14. If appointed, what notice would you require before joining the post?

As soon as I am relieved by the Govt. of Madras.

15. Are you willing to accept the minimum initial pay offered? If not, state what is the lowest initial pay that you would accept.

yes.

16. At what school(s) were you educated? (Give particulars below).

School	Date of entry	Date of leaving
Sethupathi High School, Madura. and Madura College, Madura.	1914	1924

17. Give the following particulars concerning your University or other higher education :—

Name of University	College, if any	Date of entry	Date of leaving
University of Madras.	American College. Madura.	1924	1926
"	College of Engineering. Guindy. Madras.	1926	1931
Illinois Institute of Technology, Chicago.	-	1946 (Jan.)	1947 (June)

30. 29 28

18. Give particulars of all examinations passed and degrees and technical qualifications obtained at the University or other places of higher or technical education or instruction (commencing with the Matriculation or equivalent examination).

Examination or Degree	Class or Division	Subjects taken	Date
Inter Exam. in Arts and Science.	II	Maths., Physics & Chemistry	1926
B.E. Degree	II	Mechanical & Electrical	1932
M.Sc. Degree of (Madras University)	RESEARCH	Electrical Engineering	1943
M.S. Degree of (I.I.T. Chicago)	Course-work and Research	Electrical Engineering (Power)	1947

19. (Have you done any post-graduate work or published any papers? If so give particulars and, if possible, send copies of papers. If the space below is insufficient for this purpose, please give full particulars on a sheet of paper and attach it to this application, inserting here a reference to the sheet attached.)

yes.,
Vide sheet attached sheet # 1.

20. How have you been employed? (Give particulars below.)

Name of employer	Date of joining	Date of leaving	Nature of employment	Salary
Practical Course	1930	1931	Workshop Training	-
Saxby & Farmer Ltd	1931	1932	" "	-
Govt. of Madras	1932	1934	Shift Engineer in College Power House	Rs. 75/-
"	1934	1945	Assistant in the Electrical Dept. of the same College.	Rs. 100 – 200/-
Illinois Institute of Technology. Chicago.	1946	1947	Lecture to the final term students on A.C. Machinery.	
Allis-Chalmers Manufacturing Co. Pittsburgh. Pa.	June '47	Dec. '47	Special Trainee to work in their design and development section.	$ 210. p.m.

21. Have you been a candidate for any post advertised by, or at any examination conducted by, the Federal Public Service Commission? If so, give particulars and dates, including place obtained (approximately if you do not recollect the exact place).

No.

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(The entries on this page should be in the candidate's own handwriting)

22. References :—

(These should be persons resident in India and holders of responsible positions, they should be intimately acquainted with the applicant's character and work, but must not be relations. Where the candidate has been in employment he should either give his present, or most recent, employer or immediate superior as a reference or produce a testimonial from him in regard to the candidate's fitness for the post for which he is an applicant.)

1. **Name** Dr. J. J. Rudra.
   Occupation or Position Principal. Behar College of Engineering.
   Address C/o Director of Industries. Patna.
2. **Name** Prof. M. S. Sundaram.
   Occupation or Position Education Secretary.
   Address Office of the High Commissioner for India. India House. Aldwych. Londo
3. **Name** Lt. Col. S. Paul. B.E.
   Occupation or Position Principal
   Address College of Engineering. Guindy. Saidapet. P.O Madras

23. *Copies of testimonials from :—

1. Allis. Chalmers Manufacturing Co.
2. Dr. E. J. B. Gross.
3. Dr. L. J. Rader.

* A candidate need not send copies of any testimonials unless he wishes, if he sends any, not more than three should be sent, and these should be from persons under whom he has studied or worked. Original testimonials should not be sent unless the Commission ask for them. Any number of testimonials may be produced by the candidate if he is invited to an interview with the Commission.

24. Additional Remarks :—

(Applicants may mention here any special qulifications or experience, *e.g.*, in organisation, which have not been given under the above heads. If the space below is insufficient for this purpose, please give full particulars on a sheet of paper and attach it to this application, inserting here a reference to the sheet attached.)

Vide sheet attached.
Sheet # 2.

I hereby declare that the entries in this form and the additional particulars (if any) furnished in reply to questions 19 and 24 are true to the best of my knowledge and belief.

Dated 19th July 1948

A Srinivasan
Signature of Candidate.

H145FPSC—20,000—14-2-48—GIPS

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Sheet 1.

PARTICULARS UNDER SECTION 19.

1. In addition to my normal work, I did research in my spare hours and submitted a thesis entitled " Stator-fed Commutator Motors " for which I was awarded M.SC. Degree by the University of Madras.

2. Independent of the Post-Graduate study at the Illionois Institute of Technology, Chicago, I did research and published a paper entitled " Dynamic braking of Induction Motors due to Self-excitation " in the Transactions of THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. This paper was presented on invitation at the National Winter Convention at New York in January 1947. (Reprint attached)

3. I published another paper entitled " Transient voltage rise in Transformers due to the interruption of exciting current " in the Transactions of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS and this paper also was presented on invitation at the National Fall Convention at Chicago in November 1947. (Preprint attached).

4. I wrote a paper " Adjustable speed A.C.Drives " and this paper has been referrred back to me for modification before publication.

The reprints are sent with the Advance copy of the application.

A Srinivasan

ADDITIONAL REMARKS UNDER SECTION 24.

1. I was elected as a Full Member of SIGMA XI Society which is the National Honorary Society(Fraternity) of research Scientists ,and of which almost all the Professors and Engineering Educationists of U.S.A.and Canada are Members. The membership to this Fraternity is a coveted one in these countries.

2. I was elected as a Full member of Eta Kappa Nu Society which is a National Honorary Fraternity of out-standing Electrical Engineering students of U.S.A. and Canada.

3. I am an Associate Member of The Institution of Engineers(India).

4. I am an Associate Member of the American Institute of Electrical Engineers and my promotion to full member-ship is under consideration.

5. I attended the National Convention of the American Society of Engineering Education at Minneapolis as an observer on behalf of the Government of India and was personally acquainted with all the prominent Engineering educationists of U.S.A.

6. I have visited almost all the well-known Universities of U.S.A. and Canada and also U.K. and am well acquainted with the Technical Education in those countries.

7. I visited Paris on invitation from the Vice-President of C.I.G.R.E. (International High Voltage Conference) and I have been assigned the task oforganising an Indian National Committee of C.I.G.R.E.

8. I am a Commissioned Officer in the 1st.Madras Batallion of the University Officer's Training Corps and I was the Officer Commanding the Technical Detachment before I left for U.S.A.

33 32 32

ALLIS-CHALMERS MANUFACTURING COMPANY.

Main Office - Box 512 - Milwaukee 1., Wis.

December 17, 1947.

To Whom It May Concern:

Mr. A. Srinivasan -- Engineering Activities while at the Pittsburgh Works of the Allis-Chalmers Manufacturing Company.

Following completion of his studies at Illionois Institute of Technology, Chicago, Illinois, Mr. Srinivasan embarked on a six months special Graduate Training Course in the Engineering Development Section, Pittsburgh works of Allis-Chalmers Manufacturing Company. He started this work on June 23,1947 and completed it on November 23, 1947, - with approximately one month work still remaining in his itinerary, to be spent in Norwood, Ohio, and Milwaukee, Wisconsin, Works of the Company.

* * * *

It is the opinion of all of us in the Engineering Department that he is an exceedingly able and well informed engineer and a fine gentleman. We have gained much from his association with us and he has contributed materially to the progress of engineering activities in this plant. It was a great pleasure to have him here and we regret that circumstances were such that he could not remain longer with us. He reflects great credit on his homeland and the institution of learning there through which he obtained his engineering knowledge.

Respectfully,

(Sd) P.E.Cook.

Engineer-in-Charge,
Allis-Chalmers Manufacturing Company,
Pittsburgh Works.

(True Copy).

34 33 33

COPY of letter dated 7th May, 1948 from Dr. Eric T.B.Gross, Head of the Department of Electrical Engineering of the Illinios Institute of Technology, Chicago to Dr. J.J.Rudra.

For sometime past I wanted to write to you in order to let you know that ~~wax~~ we were very glad to have Messrs. Srinivasan as graduate students and part-time instructors at our Institute. As their acadamic advisor, I got to know them very well and I have high regards for their abilities.

Mr. A. Srinivasan proved to be an experienced teacher and he was very successful in his lecture courses and also in his laboratory supervision. I believe that his thesis is a distinct contribution to the art and his standing was recognised by his election as a full member of Signa Xi, the Honorary Society in Science. As you know, we were able to arrange for a period of practical training in the Transformer Works at Pittsburgh of the Allis-Chalmers Manufacturing Company and the reports which I received about Mr. A.Srinivasan from them were very favourable. A man of his age and qualifications would, in this country, rank in the educational field as an Associate Professor and I hope that he will have the possibilities of advancement in his own country which he deserves so well.

* * * * *

In closing, I would like to congratulate you of having had such excellent men on your staff and becuase of the quality of men which your college produced.

With my best personal regards,

COPY to Sri A. Srinivasan,

Sd. J.J.RUDRA.
1-7-48.

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ILLINOIS INSTITUTE OF TECHNOLOGY.

A Consolidation of Armour Institute of Technology and Lewis Institute.

TECHNOLOGY CENTER, CHICAGO 16.

June 23, 1947.

TO WHOM IT MAY CONCERN:

"This is to certify that Mr. A. Srinivasan has taught classes for us during the last one and a half years and has proven himself to be an excellent and dependable instructor. Both in his teaching and in work leading toward his master's degree at this Institution, Mr. Srinivasan has performed very creditably all duties assigned to him.

Very truly yours,

(Sd) Louis T. Rader, Director

Department of Electrical Engineering."

(True Copy).

36 35 Ef 35

Endt.No. 1-26A/48 College of Engineering, Guindy, Madras-15, Dated: 25th July 1948.

pp. 26-29 ante

Sub: Application of Sri A.Srinivasan, Instructor in Electrical Engineering of this College for the post of Assistant Educational Adviser (Technical).

Sri A.Srinivasan has been a member of staff of this College in various capacities from 1932. He is a B.E. of the Madras University in Mechanical and Electrical branch, an M.Sc. of the Madras University in Electrical Engineering, and an M.S. of the Chicago University in Electrical Engineering (Power). He has therefore varied experience, especially on the lecturing side and laboratory and practical work. In my opinion, he is in every way fitted for the post for which he is applying. His application is submitted and very strongly recommended.

A. Paul
PRINCIPAL.

37 36

EDUCATION DEPARTMENT.

Office of the Director of Public Instruction, Madras.

SECRETARY TO GOVERNMENT
4 AUG 1948
EDUCATION AND PUBLIC HEALTH

Endorsement R.CL. No.61/48, Dated the 1st of ~~July~~ August, 1948.

Subject:- Madras Educational Service - Sri A. Srinivasan - Application for appointment to the post of Assistant Educational Advier (Technical) under the Government of India.

Reference:- Endorsement No.1-26 A/48, dated 25-7-1948 of the Principal, College of Engineering, Guindy, submitting the application dated 19-7-1948 from Sri A. Srinivasan, Offg. Instructor in Electrical Engineering, College of Engineering, Guindy.

58181

S u b m i t t e d.

2. The attention of Government is invited to the recommendation contained in the Director's Confidential letter R.CL.No.61/48, dated 21st July 1948.

3. In view of the dearth of qualified and suitable persons for appointment to teaching posts in the several Colleges of Engineering it is not desirable to permit members of the staff of the Colleges of Engineering to apply for appointment elsewhere. It is, therefore, recommended that the application may be withheld.

4. In his subsequent letter dated 28th July 1948 addressed to the Principal, College of Engineering, Guindy, Sri A.Srinivasan has stated that if he is appointed as a regular Professor of Electrical

P.T.O.

37 2.

Electrical Engineering, he will withdraw his application.

DIRECTOR OF PUBLIC INSTRUCTION.

To

The Secretary to Government,
Education and Public Health Department,
M a d r a s.

37 38 Edn.and P.H. Dept.(A). 38

M.E.S. - Sri A.Srinivasan - Apptd. temporarily as Prof. of Elec.Engg., Engg.College, Anantapur.

Read:- From the D.P.I., No.61/48, d/- 21-7-48 and Nax 1-8-48.

G.O.(MS.) No. 2126 Edn., dated 27-8-48.

Under rule 31(a) of the Genl.Rules for the Provl. & Sub. Services, Sri A.Srinivasan, offg. Instr., College of Engg. Guindy, is apptd. to officiate as Prof. of Elec.Engg., College of Engg., Anantapur, w.e.f. the date of taking charge.

2. The reason for the tempy. appt. is that the vacancy ~~xxxxx~~ shd. be filled immediately ~~there would be delay if~~ there is no candidate eligible for and/~~a~~ promotion in accordance with the rules ~~has to made.~~

3. The D.P.I. is requested to inform Sri A.Srinivasan that his applcn. dated 19-7-48 addressed to the F.P.S.C., for appt. as Asst.Educational Adviser (Tech.), has been withheld by Govt.

4. W.r.t. para 2 of his letter dated 21-7-48, the D.P.I. is informed that it is not necy. that the post of Prof. of Elec. Engg. refd. to there ~~xxxx~~ shd. be filled now by direct recruitment. Why it was previously reserved for direct recruitment was in order to give the maximum benefit to war service candidates. As a ~~suitable~~ war service candidate has not become available, and as no proportion or order, in which vacancies in the category of Profs. shd. be filled by direct recruitment and by promotion, ~~has been~~ is fixed, the vacancy may be reserved for a promotee.

5. The D.P.I. is requested to consider the qn. of regularising the tempy. appt. of Sri Srinivasan as Prof. and send a report as soon as he completes his prob. in the category of Junior Lights. in the M.E.S. and

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- 2 -

and thus becomes eligible for regular promotion as Prof. under Genl. Rule 30(a).

p.155
BK.113

To The D.P.I.
" A.G. (paras 1 & 2 only.)
" S.G.P. (for pubn. in Gazette)
" S., MPSC (paras 1 & 2 only)
" S., FPSC (para 3 only)
" Pub (C.L.)
" R.B.
" D.I.P. (2 copies)
(para 1 only)

39 38 40

Government of Madras.
Education and Public Health Department.
G.O.No. 2126 Education dated 27th August, 1948.
***

Abstract.

Madras Educational Service - Sri A.Srinivasan - Appointed temporarily as Professor of Electrical Engineering, Engineering College, Anantapur.

*.

Read the following:-

From the Director of Public Instruction Nos. 61/48, dated 21-7-48 and 1-8-48.

ORDER:-

Under rule 31(a) of the General Rules for the Provincial and Subordinate Services, Sri A.Srinivasan, officiating Instructor, College of Engineering, Guindy, is appointed to officiate as Professor of Electrical Engineering, College of Engineering, Anantapur, with effect from the date of taking charge.

2. The reason for the temporary appointment is that the vacancy should be filled immediately and there is no candidate eligible for promotion in accordance with the rules.

3. The Director of Public Instruction is requested to inform Sri A. Srinivasan that his application dated 19-7-48, addressed to the Federal Public Service Commission for appointment as Assistant Educational Adviser (Technical) has been withheld by Government.

4. With reference to para 2 of his letter dated 21-7-48, the Director Public Instruction is informed that it is no necessary that the post of Professor of Electrical Engineering referred to where should be filled now by direct recruitment. Why it was previously reserved for direct recruitment was in order to give the maximum benefit to war service candidates. As a suitable war service candidate has not become available and as no proportion or order, in which vacancies in the category of Professors should be filled by direct recruitment and by promotion, is fixed, the vacancy may be reserved for a promotee.

5. The Director of Public Instruction is requested to consider the qualification of regularizing the temporary appointment of Sri Srinivasan as Professor and send a report as soon as he completes his probation in the category of Junior Instructors in the Madras Educational Service and thus becomes eligible for <u>regular</u> promotion as Professor under General Rule 30 (a)

(By Order of His Excellency the Governor.)

M.V.Subramanian,
Secretary to Government.

To
The Director of Public Instruction.
The Accountant-General (para 1 & 2 only)
The Superintendent, Government Press (para 1 only) for publication in the Fort St. George Gazette.)
The Secretary, Madras Public Service Commission(para 1 & 2 only)
The Secretary, Federal Public Service Commission (para 3 only)
The Public (para 1 only) ~~xxx~~ (Civil List)
The Reporters Board (para 1 only)
The Director of ~~Public Instruction~~ Information & Publicity (para 1 only) (2 copies.)

True copy/Forwarded/By Order.

SUPERINTENDENT.

S/C

NO. 25/47 and
From the D.P.I. No.47/47 dated 27-4-48.

M.E.S. - Sri A. Srinivasan, tempy. Instr., Engg. College, Guindy - Request for appt. as Professor.

--

In Decr. last, the D.P.I. recommended the tempy. appointment as Prof. of Electrical Engg., A.H.College of Techy., Coimbatore, of Sri A. Srinivasan, offg. Junior Instr., who had been to the U.S.A. for higher studies in Elec. Engg. and whose return to India was expected. Shortly afterwards, however, the Director withdrew his recommendation for the reason that the date of the officer's return was not definitely known and, further, that he was considering the cases of some Pakistan-refugees for appointment.

2. Subsequently, in Feby. / March, the D.P.I. proposed the appointment, on a contract basis for 3 years, of Sri R.C. Advani, a Sind Refugee, as Professor of Elec.Engg. at Coimbatore; Sri A. Srinivasan had returned to India then and the Dir. suggested his appointment as Instructor in Elec. Engg. at the Guindy College, reverting to P.W.D. officer, who was offg. in the Instructor's post to ~~the present~~ his parent deptt. This Dept. did not support the Dir.'s proposal for the contract appt. of Sri Advani as Prof. They held that it would not be proper or justifiable to deny Sri Srinivasan the chance to act as Professor, which he would normally have had and which had been originally proposed to be given to him, and to put him instead, as Instructor, reverting in consequence of the officer already offg. ~~in that post~~ as Instructor. However, in circn. the Dir.'s proposals were accepted.

3. Sri R.C.Advani has not joined duty as Prof. He has taken up an appointment under the G. of I. But he proposes to give one month's notice to that Govt. and, on the expiry of the period of notice, to come down and take up the professorship at Coimbatore.

The D.P.I. has allowed him to do so. cf. 2

4. Sri Srinivasan has now subd. to Govt., through the proper channel, a representation, mentioning in detail the qualfns. and experience he has and showing he has better claims for the post of Professor. The petition is at pp 3-9 c.f. cf. 3-9

5. The remarks offered by the Principal of the Guindy Engg. College (Dr. J.J.Rudra, Elec.Engg.) on the petn., confirm all the statements made by the officer therein. The principal goes further and ~~pays tributes to~~ Sri Srinivasan's ~~high~~ qualfns. and vast research experience, acquired in India and in U.S.A. In short, he considers him to be eminently qualified and to possess the strongest claim for the Professorship. cf. 13-20 cf. 19-20.

6. The D.P.I., in his forwarding endt., says, inter alia, as follows:- cf. 23

> "** Ordinarily the next higher category to which Sri Srinivasan can be considered is the categ. of Instrs. ** When he has not completed his probation yet even as a Junior Instr. and has hardly any right to expect promotion even to the next higher category, viz., that of Instructors., the claim for promotion to the category of Professor (from a salary of Rs. 260 p.m. to Rs. 600 p.m.) is quite premature.
>
> "It may be pointed out that Sri R.C. Advani has been apptd. as Prof. on the scale of Rs. 500-50-700 which is lower than the existing scale of pay applicable to posts of Profs., viz., 600-75/2-900
>
> "The appt. of Mr.Advani is a special case which has been made now on a contract basis in the public interests, as otherwise, it would be difficult to secure a suitable candidate for appt. as Prof. when a new post is created some time during the ensuing academic year. In the above circms., the petr. has no legitimate grievance against the appt. of Mr. Advani which has been ordered by Govt. having regard to public interests."

7. "P" above: No such point - "public interest" was put forward by the D.P.I. at the time he recommended Sri Advani's appointment.

"N" above: This is not quite germane in the context. It is not as if the decision to appoint Sri Advani was taken in view of the fact that he offered his services for a pay lower than the regular pay applicable to the post.

"M" above: This is the position according to rules. But, when a highly qualified person (vide para 5 above) is available in the dept. itself, it is only reasonable to appoint

him in preference to an outsider.

8. Sri Srinivasan's grievance is thus understandable. As, however, Sri Advani's appt. has already been made, nothing can be done at this stage. A Prof.'s post is likely to be sanctd., from the ensuing academic year, for the Anantapur Engg. College; para 5 of the Dir.'s letter. cf. 23 Sri Srinivasan may be told that the question of his tempy. appt. as Professor will be considered when the next vacancy arises.

9. For orders.

P.S. 11.5.48

11/5/48

12/5/48 S

This deals with Sri. A. Srinivasan's claims - already present R'ct. dt. 1. His claims are however fortified by the very fine testimonials of the Principal of the Engineering College, Guindy. Dr. Advani is willing to remain in his present appointment only for a month's time & Sri. Srinivasan is given a month's notice.

Ref. 13/Sht Sr. (Secy.)

SECRETARIAT, EDN. AND P. H. DEPT. 14 MAY 1948 GOVERNMENT OF MADRAS

Let no orders be passed on above 13/A 12-5-48

For orders as to action to H.Pr. also. H.Pr. saw (B).

P.S. 14.5.48 14/5/48

15/5/48 S

Ref. 13/Sht H.Pr.

When we have sent Srinivasan for Foreign training and he is senior and duly qualified we will have to appoint him as professor. Advani we will have to appoint him as professor. If we have got another post as electrical Engineering professor we may appoint him also Advani also

C.P.R. 27/5

SECRETARIAT, EDN. AND P. H. DEPT. 27 MAY 1948 GOVERNMENT OF MADRAS

4

The file may be circulated to H.M(Edn.) w.r.t. the minute of H.Pr. on page 3 ante.

ORM 27/5/48 S/ hf 28/5/48

Hr. (Cr.)

Professor Rudra has left our service. We want another man in his place. A suggestion has been made that Sukumaran may be appointed in his place and Mr. Srinivasan may be appointed in Mr. Sukumaran's place and so I think there is already provision for this gentleman. Besides with Advani we have made a contract and so, I think, it is better we abide by that contract. H.Pr. may see again.

TSA 29.5-48

SECRETARY, EDN. AND P. H. DEPT. 29 MAY 1948 GOVERNMENT OF MADRAS

Prof. Rudra was the Principal of the Eng. college, Guindy and it has been separately proposed that Dl Col. Pande, Prof of Mechanical Eng. may be appointed as Principal in his place. Sri K. Srinivasan, Prof of Electrical communication Eng. has resigned his appointment and in that connection it has been suggested that Sri Sukumaran, Prof of Electrical Eng may be appointed as Prof of Electrical Communication Eng in the place of Sri K. Srinivasan. This suggestion has been put to the D.P.I. if the Director agrees to the appointment then Sri Sukumaran's place can be taken by Sri A. Srinivasan. It seems that this may be over the Director's reply is received without committing ourselves.

X, Prof

Pl. put up separately

ORM 28/5/48 S

Hm 29/5/48

Pl. put up separately

ORM 1/6/48 S

hf 1/6/48

Hr. (Cr.)

H.Pr.

Cl/1/6

42 pleased 5 A

My note may be circulated to H.Pr.

TSA 2.6.48

G.P.R 11/6

THE D.P.I. may be reminded for his remarks on the proposal refd. to at X on p.4 ante. A draft Memo. is submitted separately in the file concerned.

ORM 12/6/48 S hf 12/6/48

Hm 12/6/48

In I.F., the D.P.I. has reported separately that Dr.K.Sukumaran, Professor, Elec. Engg., cannot be transferred as Professor, Tele-Communications Engg. Therefore, Sri A.Srinivasan cannot be fitted in in Dr.Sukumaran's present place. The file may be re-circulated to H.M(Edn.) and H.Pr.

Cf. 18 Ksc

pg 7.7.48

ORM 9/7/48 S

hf 9/7/48

[Secy.'s notes on pp.2-3 ante and minutes and notes following may be read.]

Hm

W/M Hr. (Cr.)

H.Pr.

I do not understand what is the matter over which this file is put up. I understand Advani has refused to come and in these circumstances, if A.Srinivasan is qualified for that post, he may be appointed. The matter may be clarified and put up.

TSA 17.7-48

SECRETARY, EDN. AND P. H. DEPT. 17 JUL 1948 GOVERNMENT OF MADRAS

Sri Advani will express.

hf 17/7/48

Subd. that it is not that Sri R.C.Advani refused to accept the appt. offered to him by this Govt. He asked the D.P.I. that he might be allowed about a month's time to join duty and the Dir. complied with his request. He has since joined his

para 3, p. 1 ante

contract appointment as Professor of Elec. Engg., in the A.H.College of Techy., Coimbatore, on 14-6-1948. Sri A. Srinivasan cannot therefore be apptd. as Prof. at Coimbatore.

2. At p.4 ante, H.M. minuted that Sri Srinivasan might be apptd. as Prof. in Dr. K.Sukumaran's place. W.r.t. those minutes, it was pointed out, at p.5 ante, that that suggestion was not feasible of adoption. Therefore, in effect, no progress subsequent to H.Pr.'s minutes at p.3 ante was made, and the file was re-circulated for orders on the notes at pp.2-3 ante.

3. Now, however, the D.P.I. has proposed the tempy. appt. of Sri A.Srinivasan in the newly sanctd. post of Prof. of Elec. Engg. for the Anantapur Engg. College. The proposal may be accepted.

4. The post of Prof. of Elec. Engg. in the Coimbatore Engg. College is tempy. Sri K.N.Ramanathan, a deptl. officer, was first apptd. to it ~~temporarily~~. The post was reserved to be filled eventually by a war service candidate. The Commission which subsequently recruited ~~candidates~~ to 'reserved vacancies' in the M.E.S. found no suitable person for appt. as Prof. of Elec.Engg. In his present letter, the Dir. says that the normal procedure is to advertise the vacancy for the direct recruitment of a non-war service candidate. That statement is not correct. Although 'Direct recruitment' is one of the methods applicable ~~for~~ posts of Profs. of Engg., no proportion or rotation accg. to which vacancies shd. be filled in that category by the different methods, has been prescribed. (Even if there were such a provision, ~~it~~ would not apply to tempy. vacancies like the one at Coimbatore - in view of General Rule 5.) Therefore, it is not necessary that the post shd. be filled by direct recruitment. Why it was, however, previously reserved for direct recruitment was in order to give the maximum benefit to war service candidates. When a war service candidate has not become available, in cases of this sort, the vacancy shd. justifiably go only to a promotee. The D.P.I. may be told as above. Pub.(Ser.) may see before circn.

Public (Services) Dept.

One post of Professor of Electrical Engineering in Class V of the Madras Educational Service was reserved for being filled by direct recruitment of a candidate with war service. The Commission could not select a suitable war service candidate for the post and the Director has suggested that the vacancy may be advertised for ordinary direct recruitment. Appointment to the post is by direct recruitment or by promotion from Instructors - see rule 2(a) of the Madras Educational Service Rules. No proportion or order in which vacancies should be filled by direct recruitment and by promotion has been fixed. It is therefore open to the Govt. to fill the vacancy, either by direct recruitment or by promotion. The E & PH Dept.'s proposal that the present de-reserved vacancy may go to a promotee may be agreed to in this Dept.

Sri Srinivasan is a permanent Electrical Laboratory Assistant in the Madras Edl. Subordinate Service and is a probationer in the post of Junior Instructor in Electrical Engineering. He is now officiating as Instructor in Electrical Engineering under the emergency provisions. It is stated that there is no Instructor in Electrical Engineering who is eligible for regular promotion as Professor in the Anantapur Eng. Colg. There is no objection to the E & PH Dept.'s proposal to appoint Sri Srinivasan as Professor under emergency provisions.

The file may be returned to E & PH Dept.

8

Edn. and P.H. Dept. (A).

Sri A.Srinivasan has since subd., for transmission to the F.P.S.C., an appln. for appt. as Asst.Edl.Adviser (Tech.) under the G. of I. The D.P.I. has recommended the withholding of the appln. for the reason that there is a dearth of qualified and suitable persons for appt. to teaching posts in the several Engg.colleges. The recommendation may be accepted.

cf 36-27

p.36 cf. A para 3

2. A draft order, embodying the proposals at "R" and "S" at p.6 ante - which have been agreed to by Public - and also the Dir.'s recommendation at "A" above, is subd.

3. W.r.t. para 4 of C.F.36-7, the Dir. may ~~also~~ be asked to consider the question of regularizing the tempy. promotion as Prof. of Sri Srinivasan and send up a report as soon as he completes his probation in the category (a) of Junior Instructors. The draft provides for this also.

4. May be circd. to H.M.(Edn.) and H.Pr.

(a) This is the category in which he was first appd. to the Prof. service. When he completes his probn. in it he is eligible for promotion to any post in the service. Govt. Rule 30(a).

P.K. 11-2

P.T. 13/8

13/8/48 S

H. (Cr.) H.Pr.

TSA 14/8

(Notes from ~~middle~~ bottom of p.5 ante)

SECRETARY, EDN. AND P. H. DEPT. 14 AUG 1948 GOVERNMENT OF MADRAS

I understand that Sukumaran is retiring and wants his own terms for continuing. Why not appoint A. Sreeniwasan in Sukumaran's place as professor in that place case

G.P.R. 20/8

SECRETARY, EDN. AND P. H. DEPT. 20 AUG 1948 GOVERNMENT OF MADRAS

Dr. Sukumaran, is ~~has~~ was due to retire on 15.7.48. Orders have already been issued re-employing him till the end of the current academic year. There is no information in the Secretariat whether he intends to leave Govt service before the expiry of the period of employment. If such is entertained advice Mr. Srinivasan can

be considered for the vacancy. The post of Professor of Electrical Engg in the Guindy college has been vacant since the college re-opened and the post has to be filled immediately. In the circumstances it is for orders whether the draft order put up may issue.

Pers 25/8/48.

H.Pr. (Cr.) H.Pr.

G.P.R. 25/8

SECRETARY, EDN. AND P. H. DEPT. 26 AUG 1948 GOVERNMENT OF MADRAS

TSA 21-8-48

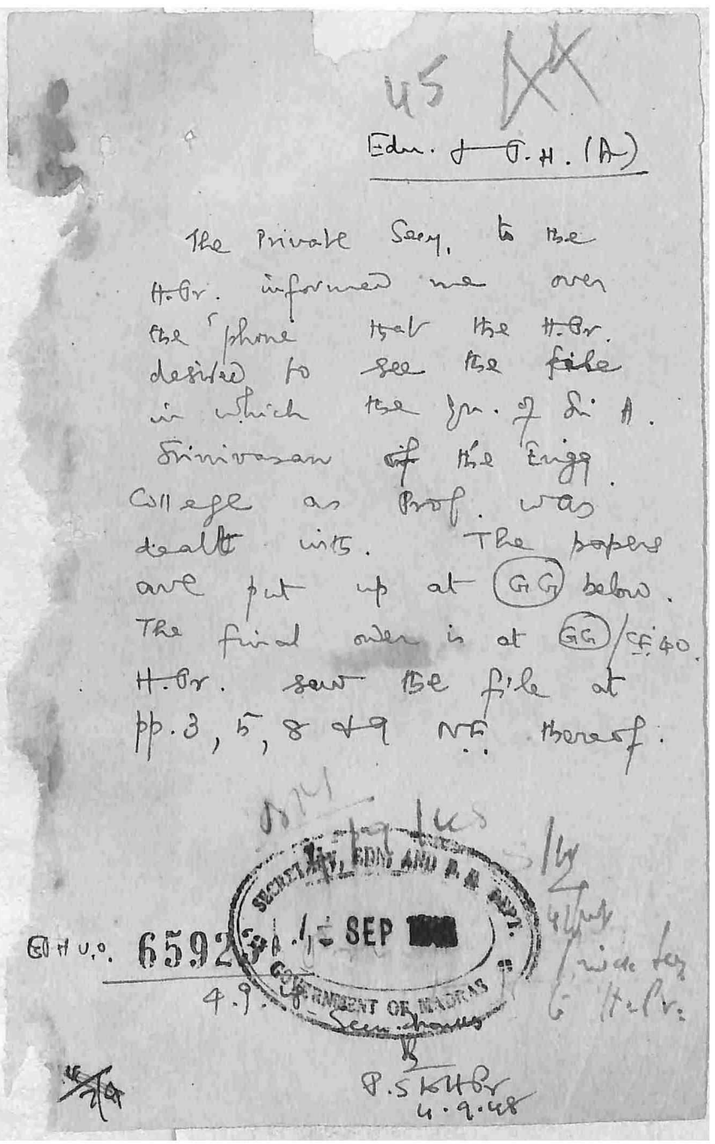
(Issued as G.O. 2128 Edn., dt - 27.8.48)

p.4 cf.

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Edn. & O.H. (A)

The Private Secy. to the H.Gr. informed me over the 'phone that the H.Gr. desired to see the file in which the Spr. of Sri A. Srinivasan of the Engg. College as Prof. was dealt with. The papers are put up at (GG) below. The final order is at (GG)/Cf.40. H.Gr. saw the file at pp. 3, 5, 8 & 9 N.F. thereof.



G.O.H.U.O. 6592

4.9.48

8.S.H.Gr
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ASST. SECRETARY TO GOVERNMENT
1- MAR 1. EDUCATION DEPARTMENT

47 A x6 3

FROM

The Director of Public Instruction,

M A D R A S.

To

The Secretary to Government,
Education and Public Health Dept.,
Madras.

Roc.47/47 dated 23rd February '49

Sir,

15490 Sub:--Madras Educational Service--Sri A. Srinivasan--Regularisation Temporary appointment as professor of Electrical Engineering.

Ref:--Govt. Memorandum No.10846-A1-Edn. dated 15-2-49.

Sri A. Srinivasan is due to complete his probation in the category of Junior Instructor in Electrical Engineering (category 5 of Class V) in the Madras Educational Service on 15th April 1950.

Yours faithfully,

Ramakrishnan

For Director of Public Instruction

CLB.26-2-49 wait

Edn. & P.H. Dept. (P)

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26.2.49

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