THE THIRD ANNUAL AWARD FOR EXCELLENCE IN TEACHING AN ANALYSIS OF PROCEDURE AND DATA

Patsy Donald Scango

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

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EXCELLENCE IN TEACHING
AN ANALYSIS OF PROCEDURE AND DATA

by

Patsy Donald Scango

Thesis Advisor: G. Musgrave

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Patsy Donald Scango
Lieutenant, United States Navy
B.S., University of Virginia, 1965

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ABSTRACT

The purpose of this thesis was to apply computer compatible decision techniques to the problem of selecting a recipient for the Rear Admiral John J. Shieffelin Award for Excellence in Teaching at the Naval Postgraduate School.

These computerized techniques were used to analyze the data from the ballots. The balloting process is described and computer programs are presented. Special studies were made using Kendell's coefficient of concordance. Their purpose was to investigate the issue of whether students and alumni rank faculty members in the same way. In addition the ranking of faculty members across years was studied. The results of this part of the study was that, on a statistical basis, it can be stated that the student and alumni ratings of faculty are similar and faculty rankings have been stable over the three years the award has been presented.

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I. INTRODUCTION

In this paper the history of the Shieffelin Award for Excellence in Teaching at the Naval Postgraduate School is discussed and the process involved in selecting the winner is explained. This process of selecting the outstanding teacher consisted of design and distribution of ballots, validation of ballots, collection of data, and computerized techniques used to analyze data. These techniques are explained and the results are examined later in this thesis.

Two statistical studies were conducted. The first was to determine if students and alumni within this years 1972 voting population ranked teachers in a similar manner. The second study was made to determine if the ranking of teachers (by students) this year was consistent with the ranking of teachers (by students) in all previous years.

II. THE COMMITTEE

The Award for Excellence in Teaching was established in May 1969 by Rear Admiral Robert W. McNitt, USN, and awarded for the first time in June of 1970. At the time that the award was established a faculty committee was formed. The objective of this committee was to select a recipient for the outstanding teaching award to be presented each year during the June graduation exercise.

The Superintendent of the Naval Postgraduate School, Rear Admiral A. S. Goodfellow, USN, on 1 March 1972 sent a letter to the Alumni members of the 1970 graduation classes. Part of this letter stated..."This June an award for excellence in teaching for the third time will be given to a member of our faculty, civilian or military. This award is now known as the Rear Admiral John J. Shieffelin Award, and was made possible through a grant to the Naval Postgraduate School Foundation. Previous winners of the award are Professor John N. Dyer of the Department of Physics and Professor Eugene C. Haderlie of the Department of Oceanography. The recipient is determined each year through a careful poll taken among alumni, students, and faculty."

This years recipient of the award again was selected by a committee of seven faculty members. The committee was composed of a Chairman, Professor D. B. Hoisington; a Secretary, Associate Professor P. J. Renard, and five other members,

Associate Professors R. H. Stolfi, C. R. Jones, Professor J. N. Dyer, and Assistant Professors G. J. Hokenson and G. L. Musgrave.

The members of this committee are selected to provide a wide variety of backgrounds and curricula. Four persons leave the committee each year and are replaced by four new members, thus, engendering new ideas and concepts in the selection process while retaining a core of persons familiar with the existing system.

Again this year, the committee decided to retain the same philosophical outlook concerning the nature of excellence in teaching along with how excellence in teaching should be reliably identified and evaluated. The interested reader will find this outlook in a previous Naval Postgraduate School thesis.[1] To set the groundwork for this paper certain guidelines for the selection process will be discussed. These guidelines are as follows:

1. All faculty with the exception of the Department Chairman, Administrators, members of the selection committee, and previous winners are eligible to receive the award.

2. The voting population includes all current students, faculty, and Curricular Officers. Also included in this is the group of Naval Officers which graduated in 1970.

3. Participation in the poll is entirely voluntary and no one is required to sign his ballot.

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[1]Robert W. Geary, "The First Annual Award for Excellence in Teaching, A Study of Procedure and Analysis of Data" (unpublished Master's thesis, U. S. Naval Postgraduate School, Monterey, California, 1970), p. 10.

4. Care and discretion are used to ensure no ranking of candidates is published.

5. For the ballot to be valid the voter must indicate that he is acquainted with at least five members on the candidate list.

6. The voter is cautioned not to vote on the basis of personality or popularity but on teaching ability and performance.

In order to maintain objectivity among the selection committee it was determined that an individual from outside the faculty would handle the ballots, collate the data and submit the results to the selection committee.

Only after the committee selected the nominee for this years award was his name made known to the selection committee. The nominee's name was then submitted to Rear Admiral A. S. Goodfellow for final approval, and remained a secret to all others until the award was presented at the June graduation.

III. THE BALLOT

A. FORMAT

An instruction sheet was attached to the front of the ballot to explain the purpose of the award, give instructions on how to complete the ballot, and explain the requirements for validating the ballot.[2]

The ballot itself was composed of four parts. Part A was a Data Processing aid to help in the analysis of the voter population characteristics. The voter was asked to identify his voter category, Rank, Branch of Service, and Curricular area if military; if Civilian his academic rank and department were to be circled.

Part B included three blanks to be used in indicating first, second, and third choices for the award using the four digit identification number in Part C.

Part C of the ballot identified all eligible faculty members from which each voter could select his first, second, and third choices. Each eligible faculty member was listed in alphabetical order under the heading of his department. The voter was asked to circle a four digit identification number of all those faculty members with whom he considered himself to be reasonably well acquainted in an academic capacity.

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[2]A sample ballot and instruction sheet are included in Appendix A.

The last portion of the ballot, Part D, was to be used to comment on the reasons for his selection. This portion was not mandatory, but was considered beneficial in the final selection processes.

B. THE BALLOTING PROCESS

Ballots were distributed to students by utilizing the student mail center (SMC). The alumni group selected to participate in this years voting were the Naval Officers who graduated in calendar year 1970. Their names and addresses were taken from a data tape maintained in the computer facility.

As an aid for addressing alumni ballots, a computer program was written which can be used in the future. The address tape can now be sorted by commands so that all graduates with similar addresses will be listed. On the basis of this years alumni sample this should mean a savings of about 24% in over all look up time since this process is done by hand the saving in time is important.

Faculty ballots were distributed by the members of the committee to the appropriate faculty mail center locations.

After voting, the completed ballot was placed in the attached envelope addressed to the Superintendent of the Naval Postgraduate School and mailed to the committee member in charge. The envelopes were coded 55 BAL to help route them to the person assembling the data.

C. BALLOT VALIDATION

1. Assembling the Data

As the ballots were returned the validation process for each ballot began. Each envelope contained an area for the voters signature, this was considered important to ensure that only one ballot was received from each voter. The envelopes and cover sheets were then discarded.

The validation process encompassed counting to ensure that Part C of the ballot had at least five identification numbers circled and the nominations for first, second, and third place were valid nominations. If less than five identification numbers were circled in Part C the ballot was considered void and eliminated from the voting process.

The committee decided that when a voter gave all three votes to the same teacher that the second and third place choices would be nullified. Each ballot was then given a four digit identification number so that specific data could be retrieved at a later time.

Of 1,319 ballots returned, 148 were deemed void because a population of five persons was not specified by the voter, and nine were returned too late to be processed. In last years voting ballots were deemed void because of write-in nominations of ineligible faculty members; however, this year's committee decided to process the ballot as valid if the other two votes were valid.

The number of void ballots has in the past been attributed to the large number of first quarter students; however,

of the 148 void ballots, 5 failed to identify their voter category, 79 were students, 40 were alumni, 23 were faculty, and 1 was a curricular officer, thus 37% of all void ballots were from the non-student population and could not be attributed to first quarter students.

IV. STATISTICAL ANALYSIS

A. TRANSFERRING DATA TO COMPUTER TAPE

After the above validation process was completed, the information from each ballot was transferred to punched cards. These data cards were then processed by a COBOL computer program called "TRANSFER"[3] which:

1. Checked for key punch errors.
2. Checked for a population of at least five teachers.
3. Gave a printed output of all ballots which contained errors.
4. Transferred the data from ballots which contained no errors to a magnetic computer tape.

The techniques used by "TRANSFER" to check for errors was based on the four digit identification number assigned to each teacher on the ballot. The first three digits of each identification number assigned to each teacher on the ballot formed a vector, $\overline{N}$, which when multiplied by a fixed weighing vector, $\overline{S}$, formed an inner product. The last digit of this inner product formed the fourth digit of the identification number.

For example, take a teacher with an identification number of 2934. The digits 293 identify the teacher, while the last digit "4" is the result of the last digit in the inner product.

$$(293)\begin{matrix}3\\5\\1\end{matrix} = 6 + 45 + 3 = 5\underline{4}$$

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[3] A listing of "TRANSFER" is included in Appendix B.

Thus each number can be checked for correctness using an error detection system where the inner product is computed and compared against the fourth digit of the identification number. Any number which was typed in error, or any nomination which the voter may have copied incorrectly from the ballot would be detected. Only after each number on each ballot was checked would that ballot be transferred to the magnetic tape. Anytime a number was in error a message would be printed giving the ballot number and the cause for the rejection. Corrections would be made to the appropriate data cards and "TRANSFER" would be run again until all valid ballots were recorded on the magnetic tape.

B. POPULATION CHARACTERISTICS

With all valid ballots recorded on tape it was possible to abstract data from this tape which would give a breakdown of the characteristics of the voting population. One of the major goals of this years committee was to increase voter response, to the maximum possible extent. The percentage of response was determined for each voter category for both this year 1972 and last year 1971. Table I. below lists the breakdown of this years ballots.

Table I. Ballot Breakdown

Voter Category	No. Eligible Voters	No. Valid Ballots	% Valid From Eligible	% Increase Over Previous Yr.
Student	1700	702	41.3	(12.8)
Alumni	580	350	61.7	14.8
Faculty	308	106	34.4	0.3
Curricular Officer	16	5	31.3	0.0
Alumni & Students	2280	1052	46.1	(6.4)

() Indicate a decrease

The last column compares the difference in the percent of valid ballots returned from the eligible population for this year and last. The table shows that there was no change in the percentage of curricular officers voting, while the percentage of students voting dropped, and the percentage of alumni and faculty voting increased.

C. CLOSER OBSERVATIONS

Further information concerning the voter population is contained in the following set of tables. Table II presents a breakdown of faculty voters by curricular department and academic rank. The columns indicate the different ranks and rows indicate academic department. By scanning the Jth column and Ith row, a determination of the number of valid ballots from faculty of I department and of J rank can be determined.

Tables III, IV, and V give a breakdown of military voters by Branch of Service, Rank, and Voter Category. Table V also includes civilian students and alumnus which attended the defense management school. The 21 in this column represents 5 civilian students and 16 civilians. The students votes are included in the percentage of student votes for that curricular area. In each table the Ith row gives the curricular area and Jth column gives either the Branch of Service, Rank, or Voter Category.

TABLE II. FACULTY

Rank Department	Instructor	Assistant Professor	Associate Professor	Professor	Total Voted	Number Enrolled
Aeronautics	-	4	5	4	13	22
Aviation Safety	2	-	1	-	3	6
Business Administration & Economics	1	2	1	2	6	31
Electronic Engineering	-	2	3	6	11	46
Government & Humanities	3	-	1	1	5	12
Material Science & Chemistry	-	-	2	1	3	12
Math	2	2	2	2	8	41
Mechanical Engineering	1	1	1	3	6	13
Meteorology	1	5	-	1	7	13
Oceanography	1	2	1	2	6	15
Operations Analysis	3	3	7	2	15	46
Physics	-	3	2	7	12	30
Navy Management Systems Center	2	3	3	3	11	21
Totals	16	27	29	34	106	308

TABLE III. BRANCH OF SERVICE

CURRICULAR AREA	NAVY	ARMY	MARINE	COAST GUARD	AIR FORCE	FOREIGN
30 Operations Analysis	129	24	6	0	0	6
31 Aeronautical Engineering	62	0	0	0	0	0
32 Electronics & Communication	91	0	0	0	0	1
33 Ordnance	46	6	0	0	0	1
34 Naval Engineering	49	0	0	0	0	3
35 Environmental Science	93	0	0	1	0	3
36 Management & Computer Science	250	0	11	3	0	1
37 Engineering Science	22	0	0	0	0	1
38 Baccalaureate	164	0	0	0	0	0
39 Defense Management	16	9	7	0	0	7
TOTALS	921	39	24	4	0	23

TABLE IV. RANK

CURRICULAR AREA	01	02	03	04	05	06
30 Operations Analysis	10	7	90	52	5	1
31 Aeronautical Engineering	12	4	29	13	4	0
32 Electronics & Communication	15	3	52	33	1	3
33 Ordnance	9	3	21	17	2	1
34 Naval Engineering	9	3	22	16	0	2
35 Environmental Science	18	3	42	30	4	0
36 Management & Computer Science	38	7	67	109	42	2
37 Engineering Science	0	4	12	6	0	1
38 Baccalaureate	32	1	43	54	33	0
39 Defense Management	2	1	8	6	14	8
TOTALS	147	36	386	336	105	18

TABLE V. VOTER CATEGORY

CURRICULAR AREA	STUDENTS			ALUMNI	CURRIC-ULAR OFFICERS
	Enrollment	Votes	Percentage		
30 Operations Analysis	276	139	50.4	26	2
31 Aeronautical Engineering	131	47	35.9	15	0
32 Electronics & Communication	186	86	46.3	21	0
33 Ordnance	145	41	28.3	12	1
34 Naval Engineering	92	39	42.4	13	1
35 Environmental Science	128	70	55.6	27	0
36 Management & Computer Science	339	140	41.0	125	1
37 Engineering Science	76	21	27.6	2	0
38 Baccalaureate	295	98	33.2	65	0
39 Defense Management	32	21	65.6	51	0
TOTALS	1700	702	41.3	357	5

D. DISTRIBUTION OF M_i

A second COBOL computer program called "PROFSORT"[4] was run. Its purpose was to reorganize the data from "TRANSFER" into records for each professor which is identified on each ballot. This new record-file is organized by ascending professor number. M_i is defined as the number of eligible faculty members known by the ith voter.

Table VI presents a frequency table of M_i. The mean number of faculty members known by the voters was 17.7 and the standard deviation was 11.6.

Table VI. FREQUENCY TABLE OF M_i

CELL	FREQUENCY
5- 9	204
10-14	321
15-19	246
20-24	166
25-29	124
30-34	47
35-39	17
40-44	10
45-49	6
50-54	4
55-59	1
60-64	2
65-69	2
70-74	1
75-79	1
80-84	0
85-89	0
90-94	1

[4] A listing of "PROFSORT" is included in Appendix B.

E. DISTRIBUTION OF N_K

A third COBOL computer program called "SCORSORT"[5] used the sorted data produced by "PROFSORT" as input. The "SCORSORT" program determined the distribution of N_K, the number of voters who knew the Kth professor. Table VII is a frequency table of N_K and figure 1 presents a histogram of N_K. The mean number of voters who knew teacher K was 70.5 with a standard deviation of 43.4. An interesting fact shown by the frequency table of N_K is that one professor was known by 274 voters.

Table VII. FREQUENCY TABLE OF N_K

CELL	FREQUENCY
1- 24	19
26- 50	75
51- 75	99
76-100	40
101-125	33
126-150	16
151-175	6
176-200	2
201-225	0
226-250	1
251-275	1

[5]A listing of "SCORSORT" is included in Appendix B.

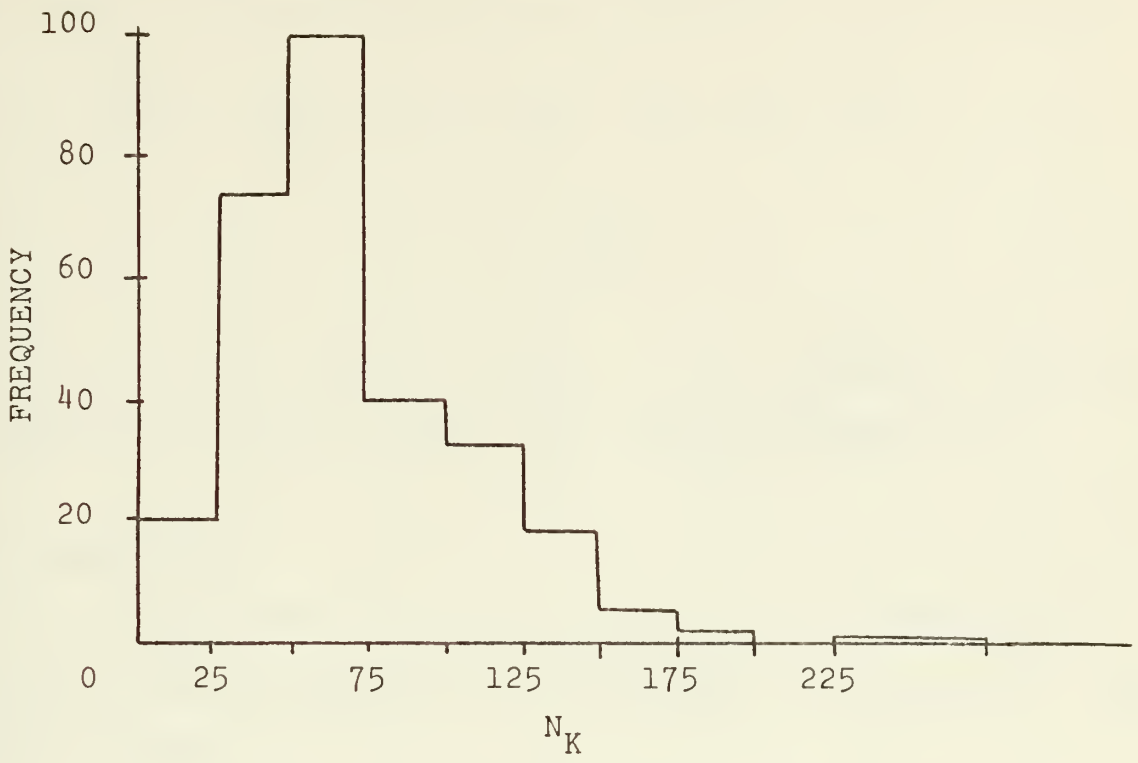

Figure 1. HISTOGRAM OF N_K

Another important result determined by "SCORSORT" was the performance of each teacher, T_K. A printout of the Kth teacher's score, S_K, is given. S_K is determined in "SCORSORT" as follows:

X_{1K} = Total number of first place votes for T_K.

X_{2K} = Total number of second place votes for T_K.

X_{3K} = Total number of third place votes for T_K.

X_{1K}, X_{2K}, X_{3K} were each divided by N_K, the number of persons who identified T_K in Part C of the ballot, yielding a vector V_K.

V_K was multiplied by a weighting vector $\overline{W}$, where $\overline{W} = (4,2,1)$, and the product was the score, S_K, for teacher K.

$$Z_K = (X_{1K} \cdot \overline{W}) + (X_{2K} \cdot \overline{W}) + (X_{3K} \cdot \overline{W})$$

$$S_K = \frac{Z_K}{N_K}$$

Table VIII presents a summary of the "SCORSORT" printout showing K, S_K, N_K, Z_K, X_{1K}, X_{2K}, and X_{3K} respectively.

F. DOMINANCE

The fourth COBOL computer program called "DOMINANCE"[6] used the results generated by "SCORSORT" for input data. This data included

X_{IK} = The number of Ith place votes received by teacher K.

N_K = Number of voters who knew T_K.

$V_{IK} = X_{IK}/N_K$ = Fraction of Ith place votes awarded T_K by the population of voters that knew him.

The purpose of this program was to reduce the number of eligible recipients by two methods, (1) absolute dominance and (2) complete dominance.

1. Background

If S_K, the score of teacher K is represented by

$$S_K = \sum_{I=1}^{3} W_I * V_{IK}$$ where $\overline{W} = (W_1, W_2, W_3)$ is a weighing vector such that

$$W_1 > W_2 > W_3 > 0. \qquad (1)$$

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[6] A listing of "DOMINANCE" is included in Appendix B.

TABLE VIII. SCORSORT SUMMARY

K	S_K	N_K	Z_K	X_{1K}	X_{2K}	X_{3K}
1	1.92157	51	98	17	11	8
2	1.77586	58	103	23	3	5
3	1.75862	29	51	9	6	3
4	1.57353	68	107	20	11	5
5	1.50000	68	102	17	13	8
6	1.47222	108	159	30	13	13
7	1.43478	69	99	19	10	3
8	1.35238	105	142	24	16	14
9	1.30994	171	224	36	31	18
10	1.26446	121	153	24	23	11
11	1.24234	74	92	14	12	12
12	1.24234	74	92	21	2	4
13	1.17073	41	48	7	7	6
14	1.13043	23	26	5	2	2
15	1.11321	106	118	20	15	8
16	1.10714	56	62	12	6	2
17	1.10606	66	73	12	10	5
18	1.08824	102	111	18	15	9
19	1.05882	34	36	6	4	4
20	1.05761	52	55	9	6	7
21	1.05128	78	82	17	6	2
22	1.00000	83	83	14	9	9
23	1.00000	27	27	5	3	1
24	0.94737	57	54	7	12	2
25	0.90805	87	79	10	16	7
26	0.90196	51	46	10	1	4
27	0.89655	116	104	19	10	8
28	0.89535	86	77	11	13	7
29	0.89130	46	41	7	5	3
30	0.88889	45	40	6	5	6
31	0.88722	133	118	22	10	10
32	0.87342	79	69	15	3	3
33	0.86364	66	57	10	4	9
34	0.84946	93	79	12	12	7
35	0.83077	65	54	10	5	4
36	0.82553	235	194	32	21	24
37	0.81731	104	85	15	8	9
38	0.81553	103	84	12	12	12
39	0.81132	53	43	7	6	3
40	0.80000	55	44	6	6	8
41	0.76860	121	93	12	17	11
42	0.75781	128	97	16	13	7
43	0.75000	28	21	3	4	1
44	0.74138	116	86	16	8	6

TABLE VIII. SCORSORT SUMMARY (Continued)

K	S_K	N_K	Z_K	X_{1K}	X_{2K}	X_{3K}
45	0.73333	30	22	4	2	2
46	0.72973	74	54	5	11	12
47	0.71233	73	52	9	5	6
48	0.63380	71	45	10	1	3
49	0.61165	103	63	10	9	5
50	0.60465	129	78	9	17	8
51	0.59302	86	51	6	12	3
52	0.58974	39	23	4	2	3
53	0.58108	74	43	5	10	3
54	0.57647	85	49	8	4	9
55	0.57377	61	35	5	6	3
56	0.56944	72	41	5	8	5
57	0.56140	57	32	3	8	4
58	0.56000	75	42	6	7	4
59	0.55932	59	33	5	5	3
60	0.55263	38	21	4	1	3
61	0.55245	143	79	11	12	11
62	0.54545	22	12	2	1	2
63	0.54015	137	74	11	11	8
64	0.53846	26	14	2	0	6
65	0.53030	66	35	5	6	3
66	0.52252	111	58	6	12	10
67	0.51923	52	27	4	3	5
68	0.51282	117	60	8	8	12
69	0.51220	82	42	8	4	2
70	0.50000	164	82	12	11	12
71	0.50000	24	12	0	5	2
72	0.49333	75	37	3	9	7
73	0.49180	61	30	4	6	2
74	0.48649	74	36	6	3	6
75	0.47423	97	46	8	4	6
76	0.47222	36	17	1	4	5
77	0.46575	73	34	5	5	4
78	0.46000	50	23	4	1	5
79	0.45652	92	42	7	4	6
80	0.45455	121	55	4	12	15
81	0.45455	44	20	4	2	0
82	0.45378	119	54	6	11	8
83	0.44828	58	26	3	6	2
84	0.44615	130	58	6	11	11
85	0.44262	61	27	4	3	5
86	0.42857	21	9	1	2	1
87	0.42553	94	40	6	4	8
88	0.42424	66	28	4	5	2

TABLE VIII. SCORSORT SUMMARY (Continued)

K	S_K	N_K	Z_K	X_{1K}	X_{2K}	X_{3K}
89	0.42169	166	70	12	5	12
90	0.41975	81	34	4	7	4
91	0.41667	60	25	3	3	7
92	0.41379	87	36	5	6	4
93	0.41071	56	23	4	3	1
94	0.40476	42	17	2	4	1
95	0.40299	67	27	4	4	3
96	0.40000	65	26	5	2	2
97	0.39726	73	29	4	4	5
98	0.39216	51	20	1	6	4
99	0.38562	153	59	7	10	11
100	0.38298	47	18	3	2	2
101	0.37931	58	22	3	3	4
102	0.37778	90	34	1	10	10
103	0.37705	61	23	3	3	5
104	0.37333	75	28	5	3	2
105	0.37255	102	38	7	3	4
106	0.36667	30	11	2	1	1
107	0.36585	41	15	1	4	3
108	0.36207	58	21	1	6	5
109	0.35556	90	32	4	5	6
110	0.35294	17	6	1	0	2
111	0.34211	38	13	3	0	1
112	0.33594	128	43	7	6	3
113	0.33333	51	17	1	5	3
114	0.32632	95	31	4	6	3
115	0.32500	40	13	1	4	1
116	0.32468	77	25	2	6	5
117	0.31579	19	6	0	3	0
118	0.31373	51	16	2	3	2
119	0.31250	48	15	2	2	3
120	0.30769	39	12	2	1	2
121	0.30769	39	12	2	2	0
122	0.30645	62	19	2	3	5
123	0.30435	115	35	7	2	3
124	0.29921	127	38	4	7	8
125	0.29167	24	7	1	0	3
126	0.29141	326	95	14	13	13
127	0.28947	38	11	1	3	1
128	0.28571	28	8	1	2	0
129	0.28125	160	45	1	12	17
130	0.28090	89	25	4	2	5
131	0.27660	47	13	2	2	1
132	0.27586	29	8	1	1	2

TABLE VIII. SCORSORT SUMMARY (Continued)

K	S_K	N_K	Z_K	X_{1K}	X_{2K}	X_{3K}
133	0.27273	44	12	1	2	4
134	0.27027	37	10	1	2	2
135	0.26923	52	14	3	0	2
136	0.26667	60	16	1	3	6
137	0.26563	64	17	2	4	1
138	0.25641	117	30	5	3	4
139	0.25385	130	33	5	5	3
140	0.25352	71	18	3	2	6
141	0.25287	87	22	3	2	6
142	0.25225	111	28	5	3	2
143	0.25000	80	20	3	2	4
144	0.25000	36	9	1	1	3
145	0.24528	53	13	1	4	1
146	0.24444	45	11	1	2	3
147	0.24138	145	35	3	8	7
148	0.23944	71	17	1	5	3
149	0.23894	113	27	3	2	11
150	0.23711	97	23	3	4	3
151	0.23404	47	11	0	3	5
152	0.22917	96	22	2	4	6
153	0.22807	57	13	2	1	3
154	0.22535	71	16	3	2	0
155	0.22222	45	10	1	3	0
156	0.22222	45	10	0	2	6
157	0.22059	68	15	2	3	1
158	0.21875	64	14	1	4	2
159	0.21667	60	13	2	2	1
160	0.21311	61	13	1	3	3
161	0.20690	29	6	0	2	2
162	0.20000	45	9	2	0	1
163	0.19512	123	24	4	2	4
164	0.19355	93	18	1	4	6
165	0.19048	42	8	0	3	2
166	0.18033	61	11	1	2	3
167	0.17778	45	8	0	4	0
168	0.17500	40	7	1	1	1
169	0.17355	121	21	3	4	1
170	0.17241	58	10	2	1	0
171	0.16867	83	14	2	2	2
172	0.16774	155	26	2	5	8
173	0.16667	54	9	1	2	1
174	0.16484	91	15	2	3	1
175	0.16129	62	10	1	2	2
176	0.15625	32	5	0	1	3

TABLE VIII. SCORSORT SUMMARY (Continued)

K	S_K	N_K	Z_K	X_{1K}	X_{2K}	X_{3K}
177	0.15254	59	9	1	2	1
178	0.15217	46	7	1	1	1
179	0.14474	76	11	1	3	1
180	0.14362	188	27	4	3	5
181	0.14286	14	2	0	1	0
182	0.13725	51	7	0	2	3
183	0.12963	54	7	1	1	1
184	0.12500	64	8	1	2	0
185	0.12088	91	11	0	4	3
186	0.12000	75	9	1	2	1
187	0.11905	42	5	0	1	3
188	0.11765	17	2	0	1	0
189	0.11667	60	7	1	1	1
190	0.11570	121	14	1	3	4
191	0.11530	26	3	0	1	1
192	0.11511	139	16	1	3	6
193	0.11111	63	7	0	3	1
194	0.11111	45	5	0	2	1
195	0.10909	110	12	1	3	2
196	0.10811	74	8	0	3	2
197	0.10280	107	11	0	3	5
198	0.10169	59	6	0	2	2
199	0.10169	59	6	1	0	2
200	0.10000	70	7	1	1	1
201	0.10000	40	4	1	0	0
202	0.09804	102	10	1	2	2
203	0.09756	41	4	0	2	0
204	0.09459	74	7	1	0	3
205	0.09434	53	5	1	0	1
206	0.09346	107	10	1	2	2
207	0.09302	43	4	1	0	0
208	0.09091	77	7	1	1	1
209	0.09091	55	5	1	0	1
210	0.09091	33	3	0	1	1
211	0.09091	33	3	0	1	1
212	0.08889	90	8	0	3	2
213	0.08725	149	13	1	3	3
214	0.08571	70	6	0	2	2
215	0.08511	47	4	1	0	0
216	0.08475	59	5	0	2	1
217	0.08333	12	1	0	0	1
218	0.08235	85	7	1	0	3
219	0.07692	39	3	0	1	1
220	0.07692	26	2	0	1	0

TABLE VIII. SCORSORT SUMMARY (Continued)

K	S_K	N_K	Z_K	X_{1K}	X_{2K}	X_{3K}
221	0.07576	66	5	0	2	1
222	0.07500	80	6	1	1	0
223	0.07353	68	5	1	0	1
224	0.07333	150	11	1	3	1
225	0.06897	58	4	0	1	2
226	0.06667	30	2	0	0	2
227	0.06410	78	5	0	2	1
228	0.06250	32	2	0	1	0
229	0.06250	32	2	0	0	2
230	0.06000	50	3	0	1	1
231	0.05556	108	6	1	0	2
232	0.05357	56	3	0	1	1
233	0.05172	58	3	0	1	1
234	0.04762	105	5	1	0	1
235	0.04545	22	1	0	0	1
236	0.04444	90	4	1	0	0
237	0.04324	185	8	2	0	0
238	0.04317	139	6	1	1	0
239	0.04167	48	2	0	0	2
240	0.03704	54	2	0	1	0
241	0.03676	136	5	1	0	1
242	0.03636	55	2	0	1	0
243	0.03614	83	3	0	1	1
244	0.03604	111	4	0	2	0
245	0.03390	59	2	0	1	0
246	0.03279	61	2	0	0	2
247	0.03261	92	3	0	1	1
248	0.02778	36	1	0	0	1
249	0.02703	74	2	0	0	2
250	0.02703	37	1	0	0	1
251	0.02632	38	1	0	0	1
252	0.02564	39	1	0	0	1
253	0.02326	43	1	0	0	1
254	0.01818	55	1	0	0	1
255	0.01786	56	1	0	0	1
256	0.01449	69	1	0	0	1
257	0.00990	101	1	0	0	1
258	0.00926	108	1	0	0	1
259	0.00714	140	1	0	0	1
260	0.00000	100	0	0	0	0
261	0.00000	91	0	0	0	0
262	0.00000	89	0	0	0	0
263	0.00000	85	0	0	0	0
264	0.00000	71	0	0	0	0

TABLE VIII. SCORSORT SUMMARY (Continued)

K	S_K	N_K	Z_K	X_{1K}	X_{2K}	X_{3K}
265	0.00000	67	0	0	0	0
266	0.00000	66	0	0	0	0
267	0.00000	61	0	0	0	0
268	0.00000	58	0	0	0	0
269	0.00000	57	0	0	0	0
270	0.00000	54	0	0	0	0
271	0.00000	50	0	0	0	0
272	0.00000	49	0	0	0	0
273	0.00000	39	0	0	0	0
274	0.00000	38	0	0	0	0
275	0.00000	38	0	0	0	0
276	0.00000	34	0	0	0	0
277	0.00000	34	0	0	0	0
278	0.00000	32	0	0	0	0
279	0.00000	31	0	0	0	0
280	0.00000	29	0	0	0	0
281	0.00000	27	0	0	0	0
282	0.00000	26	0	0	0	0
283	0.00000	26	0	0	0	0
284	0.00000	24	0	0	0	0
285	0.00000	23	0	0	0	0
286	0.00000	22	0	0	0	0
287	0.00000	22	0	0	0	0
288	0.00000	22	0	0	0	0
289	0.00000	20	0	0	0	0
290	0.00000	14	0	0	0	0
291	0.00000	3	0	0	0	0

Expression (1) states that a first place vote should be weighted higher than a second place vote, which in turn should be weighted higher than a third place vote, and that all weights be greater than zero.

A second set of restrictions on the weights logically would be that no two weights be the same or that

$$W_2 / W_1 < 1 \qquad (2)$$

$$W_3 / W_2 < 1 \qquad (3)$$

therefore from (1), (2), and (3) we have

$$0 < W_2/W_1 < 1$$

$$0 < W_3/W_2 < 1$$

Now letting (a_1,b_1) and (a_2,b_2) define a preferential region interior to the unit square then

$$0 < a_1 \leq W_2/W_1 \leq b_1 < 1$$

$$0 < a_2 \leq W_3/W_2 \leq b_2 < 1$$

The values

$$a_1 = a_2 = 1/3$$

$$b_1 = b_2 = 2/3$$

were used as acceptable parameters based on a determination of the smallest and largest ratios acceptable for the three weights.

2. Absolute Dominance

If K and K' denote any two teachers, S_K and $S_{K'}$ are their respective scores from "SCORSORT" then it is desired to find all values of $\overline{W}$ such that

$$S_K \geq S_{K'}. \quad \text{For all } K \neq K'$$

therefore by substitution,

$$W_1 V_{1K} + W_2 V_{2K} + W_3 V_{3K} \geq W_1 V_{1K'} + W_2 V_{2K'} + W_3 V_{3K'} \quad (4)$$

or

$$W_1 (V_{1K} - V_{1K'}) + W_2 (V_{2K} - V_{2K'}) + W_3 (V_{3K} - V_{3K'}) \geq 0 \quad (5)$$

Then teacher K is absolutely dominant over teacher K' when $V_{1K} - V_{1K'} > 0$, $I = 1, 2, 3$, for then $S_K > S_{K'}$ and teacher K' can be eliminated from the competition.

3. Complete Dominance

The second form of dominance, complete dominance eliminates all teachers who in order to win must have a weighting system that violates $W_1 > W_2 > W_3$.

From (5)

$$\frac{W_1}{W_2} (V_{1K} - V_{1K'}) + (V_{2K} - V_{2K'}) + \frac{W_3}{W_2} (V_{3K} - V_{3K'}) \geq 0 \quad (6)$$

or

$$\frac{W_3}{W_2} \geq \frac{-(V_{1K} - V_{1K'}) W_1}{(V_{3K} - V_{3K'}) W_2} - \frac{(V_{2K} - V_{2K'})}{(V_{3K} - V_{3K'})}$$

The dominance relationship is determined by W_1, W_2, and W_3 since all values of V_{1K} and $V_{1K'}$ are known.

Letting $Y = W_3 / W_2$, $X = W_1 / W_2$ and noting that $0 \leq Y \leq 1$ and $X \geq 1$ then letting

$$A = (V_{1K} - V_{1K'})$$

$$B = -(V_{2K} - V_{2K'})$$

$$C = V_{3K} - V_{3K'}$$

and substituting into expression (5) we have $Y = \frac{AX}{C} + \frac{B}{C}$ which is the slope intercept form for a line.

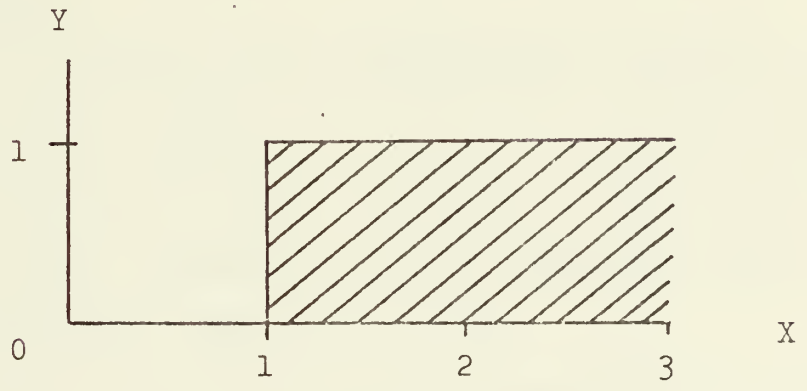

Figure 2. DOMINANCE PLOT

Figure 2 is a plot of Y vs X with the feasible region shown for the weights. Teacher K is completely dominated by teacher K' if either

1) $A/C > 0$ and $Y(1) > 1$ $\qquad C > 0$

2) $A/C < 0$ and $Y(1) < 0$ $\qquad C < 0$

3) $C = 0$ and

a) $-A < 0$ and $B/A < 1$

b) $-A = 0$ and $-B < 0$

4. Results

Table IX presents a summary of the dominance tests. T_K', V_{1K}, V_{2K}, and V_{3K} are defined above, AD and CD are results of absolute and complete dominance. A one indicates that a teacher is dominated and a zero indicates a teacher is not dominated and has not been eliminated.

After screening for absolute dominance only 4 teachers out of 279 remained in contention, and the complete dominance reduced this number to two.

G. COMPARISONS

A Fortran program called "COMPARISON"[7] compares the scores of the Ith teacher against that of the Jth teacher with the constraint that each of these teachers is known by a given voter. The study compared the twenty teachers with the highest score from "SCORSORT" with each other.

The final score for each paired comparison was based only on the sub-population of voters that identified both teachers. The teacher ranked first in "SCORSORT" would be expected to win over all other teachers, and the teacher ranked last would be expected to lose to all other. If the first teacher

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[7] A listing of COMPARISON" is included in Appendix B.

TABLE IX. DOMINANCE TEST RESULTS

T_K	V_{1K}	V_{2K}	V_{3K}	AD	CD
1	0.333	0.216	0.157	0	0
2	0.397	0.052	0.086	0	0
3	0.310	0.207	0.103	1	1
4	0.294	0.162	0.074	1	1
5	0.250	0.191	0.118	1	1
6	0.278	0.120	0.120	1	1
7	0.275	0.145	0.043	1	1
8	0.229	0.152	0.133	1	1
9	0.211	0.181	0.105	1	1
10	0.198	0.190	0.091	1	1
11	0.189	0.162	0.162	0	1
12	0.284	0.027	0.054	1	1
13	0.171	0.171	0.146	1	1
14	0.217	0.087	0.087	1	1
15	0.189	0.142	0.075	1	1
16	0.214	0.107	0.036	1	1
17	0.182	0.152	0.076	1	1
18	0.176	0.147	0.088	1	1
19	0.176	0.118	0.118	1	1
20	0.173	0.115	0.135	1	1
21	0.218	0.077	0.026	1	1
22	0.169	0.108	0.108	1	1
23	0.185	0.111	0.037	1	1
24	0.123	0.211	0.035	1	1
25	0.115	0.184	0.080	1	1
26	0.196	0.020	0.078	1	1
27	0.164	0.086	0.069	1	1
28	0.128	0.151	0.081	1	1
29	0.152	0.109	0.065	1	1
30	0.133	0.111	0.133	1	1
31	0.165	0.075	0.075	1	1
32	0.190	0.038	0.038	1	1
33	0.152	0.061	0.136	1	1
34	0.129	0.129	0.075	1	1
35	0.154	0.077	0.062	1	1
36	0.136	0.089	0.102	1	1
37	0.144	0.077	0.087	1	1
38	0.117	0.117	0.117	1	1
39	0.132	0.113	0.057	1	1
40	0.109	0.109	0.145	1	1
41	0.099	0.140	0.091	1	1
42	0.125	0.102	0.055	1	1
43	0.107	0.143	0.036	1	1
44	0.138	0.069	0.052	1	1
45	0.133	0.067	0.067	1	1
46	0.068	0.149	0.162	0	1
47	0.123	0.068	0.082	1	1
48	0.141	0.014	0.042	1	1
49	0.097	0.087	0.049	1	1
50	0.070	0.132	0.062	1	1

were to lose in any of the tests then significant argument might be made for giving the award to another of the high ranking teachers.

The results of the paired comparison analysis for the top twenty teachers were computed; however, since the teachers who were found to be dominant, violated the constraint that they have some voters in common, the results did not enter into the final selection process.

V. THE SELECTION

Once all the results were obtained, a set of statistics was prepared and presented to this years selection committee. This presentation included:

1. Statistics on the voting population
2. Printed results of all computer programs
3. Results of dominance tests
4. An abstract of comments from all ballots in which the individuals passing the dominance tests had been identified.

Following the above presentation, the committee voted unanimously for teacher number one.

The winners name was forwarded to the Academic Dean and Superintendent and will be made public at the June graduation ceremonies.

The names of individual teachers concerned were unknown to the selection committee throughout the process. At the time the above ballot results were revealed, the only name announced was that of the winner, which will continue to remain secret until announced at the graduation ceremonies.

VI. RECOMMENDATIONS

As was noted in table I, alumni and faculty show an increase in the percentage of voters over the previous years. Some possible causes for the decrease in students response might be attributed to

1. The timing of the distribution of the ballots was such that the voting extended over an exam period.
2. The long response time given to students may have caused students to put off responding, thus, causing them to forget about responding altogether.
3. It was possible this year due to a special letter which was attached to the alumni ballot to correct ballots which were labeled as students, but definitely from an alumnus to be corrected. This problem of alumni still identifying as students is obviously a reoccurring problem and a more meaningful statistic would be a comparison of alumni and students together. However, this figure also showed a decrease in response.

Next years committee should consider shortening the response time, avoiding exam periods, and redesigning Part A of the ballot so as to eliminate common errors made in voter statistics.

A. REVISION OF PART A

The problem of ballots with no voter category was eliminated this year primarily because the ballots for different groups were printed at different times. With the small changes which were made it was possible in many cases to identify voter category even if it were left blank. However, the problems of blank voter category is one which still must be solved. The possible causes listed here are:

1. The instructions concerning the voter category were vague and misinterpreted.

2. Voter did not want to take time to fill out Part A.

3. The voter did not want to be identified.

Of the above, the most likely explanation concerns the instruction sheet. The reference to Part A was given in step 1. The instructions given in Part A proved to be inadequate. Major mistakes were

1. Student / Alumnus / Faculty / Curricular Officer Section – circled wrong choice. This could be eliminated by having instructions which state:

   YOU ARE PRESENTLY A (CIRCLE ONE)
   S Student
   A Alumnus
   F Faculty Member
   C Cirricular Officer

2. Rank – In many cases this was circled to indicate branch of service. (01 was circled because it was to the left of N Navy). This accounts for the large number of ensigns which were recorded as having voted. Instructions such as:

   (Military only circle your present rank)
   01 02 03 04 05 06 07

   should eliminate this problem area.

3. A common problem was that civilian students were confused as to what area to circle. Most of them used the area meant for faculty because it was labeled civilian. A possible solution would be relabeling and adding a voter category of civilian under branch of service.

Part A would thus look like this if all my suggestions were incorporated:

A1 - (All) You are presently a (Encircle one)
S Student
A Alumnus
F Faculty member
C Curricular Officer

A2 - (Military Only) Your present rank is: (Encircle one)

01 02 03 04 05 06 07

A3 - (All) (Encircle code at left)

Students/ Alumni/ Curricular Officers

Branch of Service		Curricular Area	
C	Civilian	30	Ops Analysis
N	Navy	31	Aero Eng
M	Marine Corps	32	Elec & Comm Eng
C	Coast Guard	33	Ordnance
A	Army	34	Naval Eng
L	Air Force	35	Env Sci
F	Foreign	36	Mange & Compt Sci
		37	Eng Sci
		38	Baccalaureate
		39	Def Management

Faculty

Position		Department	
IR	Instructor	AE	Aeronautics
AT	Assist Prof	AO	Aviation Safety
AC	Assoc Prof	MN	Bus Ad & Econ
PR	Professor	EE	Ele Eng
		GH	Govt & Human
		MC	Mat Sc & Chem
		MA	Math
		ME	Mech Eng
		MR	Meteorology
		OC	Oceanography
		OA	Ops Analysis
		PH	Physics
		NS	Navy Mange Sys Center

B. COMMITTEE RECOMMENDATION

This years committee has recommended that in the future alumni from the selected year also include U. S. Marines, Coast Guard, Air Force, and Foreign Officer graduates.

VII. FURTHER ANALYSIS

With three years of data to work with some questions concerning the ranking of teachers could be examined.

1. Do students and alumni tend to rank teachers similarly?
2. Does the ranking of teachers by students remain fairly constant from year to year?

These questions are addressed is subsection A.

A. CONCORDANCE ESTIMATION

Using Kendall's[8] coefficient of concordance, the degree of resemblance between two sets of data can be determined. If the coefficient is close to one the two data sets show similar rankings. The further the coefficient is from one and the closer it is to zero the less the two sets resemble each other. Thus, this test can be used to determine if a teacher which is ranked high by student voters would also be ranked high by alumni.

Table X is a 2 x 175 matrix of the rankings of teachers which were known by at least 10 voters from each group. The first row is the ranking of the teachers by the alumni and the second row represents the ranking by the students.

Kendall defines the relationship as

$$W = \frac{12(S)}{m^2(n^3-n) - 12mT}$$

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[8] Kendall, M. G., Rank Correlation Methods, 2d e., p. 3-11, 94-100, Griffin, 1955.

where W is the coefficient of concordance, m is the number of raters, n is the number of rankings, S is the total sum of squares of actual deviations, $T = \sum_{i=1}^{n}(t_i^3 - t_i)$, and t indicates number of ties of length i.

A computer program was written which computed all values from the table. Its results indicated that

$$W = \frac{12\ (1368609)}{((2)^2((175)^3 - 175))) - (12 * 2 * 3394)} = .7690$$

The significance of W may be tested using Fisher's[9] Z, letting $Z = 1/2 \log_e \frac{(m-1)\ W}{1-W} = .6013$. The appropriate degrees of freedom for consulting the Z table, are

$$V_1 = (n-1) - \frac{2}{m} = 173$$

$$V_2 = (m-1) \cdot V_1 = 173$$

and the appropriate value of Z in the table is .125 for the 5% level of significance. Since the calculated value of Z = .6013 is greater than the tabulated test value, W is therefore significantly different from zero. This indicates that we can reject the hypothesis that the rankings by the students are unrelated to those of the alumni. A teacher who is ranked high by students will also tend to be ranked high by alumni.

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[9]Fisher, R. A. and Yates, F., Statistical Tables, p. 50, Hafner, 1957.

A second study was conducted to determine if rankings of the faculty were stable across three different voting populations. All teachers which were eligible to receive the Award for Excellence in Teaching and were known by at least ten students in 1970, 1971, and 1972 voting were ranked by the students from each year.

Table XI is a 3 x 105 matrix of the rankings of each teacher. The first through third rows are the rankings of students from 1970, 1971, and 1972 respectively.

Again using the coefficient of concordance and the new computer program the results indicated that

$$W = \frac{12\ (500957.4)}{(3)^2\ ((105)^3 - 105)\ (12 * 3 * 6)} = .577058$$

and $Z = 1/2 \log_e \frac{(m-1)\ W}{1 - W} = .2967$

The appropriate degrees of freedom for Z are

$$V_1 = (n-1) - \frac{2}{m} = 104.3$$

$$V_2 = (m-1) \cdot V_1 = 208.7$$

and the appropriate value of Z in the table is .136 for the 5% level of significance.

Since the calculated value of Z = .297 is greater than the test value, W is significantly different from zero. This again indicates that the rankings of teachers was not random and that a teacher's ranking was stable across years.

TABLE X. CONCORDANCE MATRIX 1

Alumni	1.0	2.0	3.0	4.5	6.0	7.0
Student	31.0	32.0	66.0	26.0	23.0	38.0
Total	32.0	34.0	69.0	30.5	27.5	44.0
Alumni	9.0	10.0	11.0	12.0	13.0	14.0
Student	13.0	24.0	48.0	29.0	19.0	122.0
Total	22.0	34.0	59.0	41.0	32.0	136.0
Alumni	15.0	16.0	17.0	19.0	19.0	19.0
Student	145.0	9.0	10.0	2.0	84.0	102.0
Total	160.0	25.0	27.0	21.0	103.0	121.0
Alumni	21.0	22.0	23.0	24.0	25.0	26.5
Student	63.0	1.0	21.0	107.0	136.5	70.0
Total	84.0	23.0	44.0	133.0	161.5	96.5
Alumni	28.0	29.0	30.0	31.0	32.0	33.0
Student	79.0	82.5	86.0	57.0	8.0	146.0
Total	107.0	111.5	116.0	88.0	40.0	179.0
Alumni	34.0	35.0	36.0	37.0	38.0	39.0
Student	6.0	68.5	95.0	51.0	152.0	141.0
Total	40.0	103.5	131.0	88.0	190.0	180.0
Alumni	40.0	41.5	41.5	43.0	44.0	45.0
Student	17.0	73.0	46.0	99.5	5.0	32.0
Total	57.0	114.5	87.5	142.5	49.0	79.0
Alumni	46.0	47.0	48.0	49.0	50.5	50.5
Student	20.0	114.0	91.0	22.0	54.0	78.0
Total	66.0	161.0	139.0	71.0	104.5	128.5
Alumni	52.0	53.0	54.5	54.5	56.0	57.0
Student	132.0	28.0	52.0	128.5	104.0	50.0
Total	184.0	81.0	106.5	183.0	160.0	107.0
Alumni	58.0	59.0	61.0	61.0	61.0	63.0
Student	58.0	71.0	59.0	68.5	7.0	11.0
Total	116.0	130.0	120.0	129.5	68.0	74.0

TABLE X. CONCORDANCE MATRIX 1 (Continued)

Alumni	64.0	65.0	66.5	66.5	68.0	69.0
Student	53.0	97.0	35.0	76.5	15.0	123.5
Total	117.0	162.0	101.5	143.0	83.0	192.5
Alumni	70.0	71.0	73.0	73.0	73.0	75.0
Student	61.0	117.0	147.0	30.0	12.0	89.0
Total	131.0	188.0	220.0	103.0	85.0	164.0
Alumni	77.0	77.0	77.0	79.5	79.5	81.0
Student	81.0	39.0	33.0	94.0	42.5	138.0
Total	158.0	116.0	80.0	173.5	122.0	219.0
Alumni	82.5	82.5	84.5	84.5	86.5	86.5
Student	76.5	18.0	74.0	90.0	103.0	55.0
Total	159.0	100.0	158.5	174.5	189.5	141.5
Alumni	88.0	89.0	90.5	90.5	92.0	93.0
Student	108.0	110.0	156.5	164.5	116.0	148.0
Total	196.0	199.0	227.0	255.0	208.0	241.0
Alumni	94.0	95.0	96.5	96.5	98.5	98.5
Student	14.0	42.5	120.0	99.5	85.0	45.0
Total	108.0	127.5	217.5	196.0	183.5	143.5
Alumni	100.0	101.0	102.0	103.0	104.0	105.0
Student	164.5	41.0	88.0	66.0	164.4	134.0
Total	264.5	142.0	190.0	169.0	268.5	239.0
Alumni	106.0	107.5	107.5	109.5	109.5	111.0
Student	87.0	164.5	16.0	49.0	47.0	105.0
Total	193.0	272.0	123.5	158.5	156.5	216.5
Alumni	112.5	112.5	114.0	115.0	116.0	117.0
Student	101.0	92.0	127.0	36.0	111.0	112.0
Total	213.5	204.5	241.0	151.0	227.0	229.0
Alumni	118.0	119.0	120.5	120.5	122.0	123.0
Student	164.5	128.5	37.0	96.0	56.0	133.0
Total	282.5	247.5	157.5	216.5	178.0	256.0

TABLE X. CONCORDANCE MATRIX 1 (concluded)

Alumni	124.5	124.5	126.0	128.0	128.0	128.0
Student	98.0	44.0	164.5	27.0	143.5	60.0
Total	222.5	168.5	290.5	155.0	271.5	188.0
Alumni	131.0	132.5	132.5	134.0	135.0	136.0
Student	150.0	164.6	139.5	123.5	33.0	72.0
Total	281.0	297.0	272.0	257.5	168.0	208.0
Alumni	137.5	137.5	139.0	130.0	141.0	142.0
Student	142.0	164.5	66.0	164.5	119.0	164.4
Total	279.5	302.0	205.0	304.5	260.0	306.5
Alumni	143.0	144.0	160.0	160.0	160.0	160.0
Student	75.0	130.0	164.5	153.0	109.0	135.0
Total	218.0	274.0	324.5	313.0	269.0	295.0
Alumni	160.0	160.0	160.0	160.0	160.0	160.0
Student	126.0	151.0	121.0	118.0	164.5	82.5
Total	286.0	311.0	281.0	278.0	324.5	242.5
Alumni	160.0	160.0	160.0	160.0	160.0	160.0
Student	164.5	164.5	113.0	62.0	40.0	164.5
Total	324.5	324.5	273.0	222.0	200.0	324.5
Alumni	160.0	160.0	160.0	160.0	160.0	160.0
Student	139.5	80.0	93.0	149.0	164.5	164.5
Total	299.5	240.0	253.0	309.0	324.5	324.5
Alumni	160.0	160.0	160.0	160.0	160.0	160.0
Student	125.0	64.0	105.5	131.0	164.5	164.5
Total	285.0	224.0	265.5	291.0	324.5	324.5
Alumni	160.0	160.0	160.0			
Student	164.5	164.5	164.5			
Total	324.5	324.5	324.5			

TABLE XI. CONCORDANCE MATRIX 2

Students '72	1.0	2.0	3.0	4.0	5.0	6.0
Students '71	36.0	39.0	31.0	7.0	95.0	20.0
Students '70	1.0	18.0	2.0	8.0	7.0	25.0
Total	38.0	59.0	36.0	19.0	107.0	51.0
Students '72	7.0	8.0	9.0	10.0	11.0	12.0
Students '71	44.0	84.0	6.0	4.0	47.0	30.0
Students '70	13.0	14.0	34.5	10.0	23.0	40.0
Total	64.0	106.0	49.5	24.0	81.0	82.0
Students '72	13.0	14.0	15.0	16.0	17.0	18.0
Students '71	16.5	19.0	83.0	2.0	33.0	38.0
Students '70	36.0	5.0	22.0	15.0	57.0	16.0
Total	65.5	38.0	120.0	33.0	107.0	72.0
Students '72	19.0	20.0	21.0	22.0	23.0	24.0
Students '71	51.0	101.0	57.0	72.0	13.0	29.0
Students '70	28.0	45.0	33.0	11.0	34.5	12.0
Total	98.0	166.0	121.0	105.0	70.5	65.0
Students '72	25.0	26.0	27.0	28.0	29.0	30.0
Students '71	60.0	24.0	48.0	80.0	18.0	76.0
Students '70	17.0	27.0	55.0	19.0	44.0	24.0
Total	102.0	77.0	130.0	127.0	91.0	130.0
Students '72	31.0	32.0	33.5	33.5	35.0	36.0
Students '71	66.0	52.5	21.0	12.0	8.0	82.0
Students '70	102.0	37.0	26.0	71.5	58.0	41.0
Total	199.0	121.5	80.5	117.0	101.0	159.0
Students '72	37.0	38.0	39.0	40.0	41.0	42.0
Students '71	92.0	71.0	40.5	84.5	56.0	10.0
Students '70	52.0	39.0	6.0	29.0	93.5	69.0
Total	181.0	148.0	85.5	153.5	190.5	121.0
Students '72	43.0	44.0	45.0	46.0	47.0	48.0
Students '71	97.0	90.0	67.5	32.0	63.0	74.0
Students '70	50.0	85.0	65.0	78.0	61.0	98.5
Total	190.0	219.0	177.5	156.0	171.0	220.5
Students '72	49.0	50.0	51.0	52.0	53.0	54.0
Students '71	73.0	5.0	89.0	75.0	26.0	49.0
Students '70	77.0	42.0	91.0	20.0	100.0	101.0
Total	199.0	97.0	231.0	147.0	179.0	204.0

TABLE XI. CONCORDANCE MATRIX 2 (Continued

Students '72	55.0	56.0	57.0	58.0	59.0	60.0
Students '71	54.0	46.0	34.0	15.0	99.0	9.0
Students '70	63.0	38.0	76.0	53.0	62.0	81.0
Total	172.0	140.0	167.0	126.0	220.0	150.0
Students '72	61.0	62.0	63.0	64.0	65.0	66.0
Students '71	61.0	27.0	58.0	93.0	25.0	35.0
Students '70	103.0	30.0	31.0	3.0	70.0	32.0
Total	225.0	119.0	152.0	160.0	160.0	133.0
Students '72	67.0	68.5	68.5	70.0	71.0	72.0
Students '71	64.0	69.0	43.0	50.0	96.0	65.0
Students '70	54.0	92.0	98.5	80.0	60.0	68.0
Total	185.0	229.5	210.0	200.0	227.0	185.0
Students '72	73.0	74.0	75.0	76.0	77.0	78.0
Students '71	1.0	100.0	11.0	98.0	86.0	22.0
Students '70	96.0	82.0	49.0	48.0	86.0	79.0
Total	170.0	256.0	135.0	222.0	249.0	179.0
Students '72	79.0	80.0	81.0	82.0	83.0	84.0
Students '71	103.5	52.3	103.5	70.0	23.0	45.0
Students '70	83.0	51.0	97.0	64.0	95.0	67.0
Total	265.5	183.5	281.5	216.0	201.0	196.0
Students '72	85.0	86.0	87.0	88.0	89.0	90.0
Students '71	28.0	67.0	16.5	37.0	88.0	59.0
Students '70	46.0	75.0	9.0	47.0	74.0	93.5
Total	159.0	228.0	112.5	172.0	251.0	242.5
Students '72	91.0	92.0	93.0	94.0	95.0	96.0
Students '71	105.0	91.0	14.0	55.0	42.0	62.0
Students '70	71.5	66.0	43.0	89.0	73.0	90.0
Total	267.5	249.0	150.0	238.0	210.0	248.0
Students '72	97.0	98.0	99.0	100.0	101.0	102.0
Students '71	77.0	94.0	81.0	87.0	79.0	3.0
Students '70	59.0	105.0	84.0	87.0	56.0	4.0
Total	233.0	297.0	264.0	274.0	236.0	109.0
Students '72	103.0	104.0	105.0			
Students '71	40.5	78.0	102.0			
Students '70	21.5	88.0	104.0			
Total	164.5	270.0	311.0			

APPENDIX A

THE REAR ADMIRAL JOHN J. SHIEFFELIN AWARD FOR EXCELLENCE IN TEACHING

In order to augment the existing incentives for teaching of high quality, an award for Excellence in Teaching has been established by the Superintendent. A substantial stipend was made possible through a gift to the Naval Postgraduate School Foundation in honor of Rear Admiral John J. Shieffelin, USN. The judgments of those who have participated in the educational processes at the Naval Postgraduate School are of primary importance in determining the recipient. This poll is being conducted to assess the collective opinion of students, faculty, staff, and selected alumni. After accumulating and processing the voting results, the Selection Committee will recommend an Awardee to the Superintendent.

A meaningful selection of the Award receipient is heavily dependent upon input from a large portion of the eligible voters. Your response is therefore earnestly requested. Please complete the enclosed ballot in accordance with the instructions below. The results of the polling, other than the name of the Award recipient, will be treated as privileged information.

BALLOTING PROCEDURE:

Step 1. Complete the information requested at the top (Part A) of the ballot. These items are for purposes of statistical analyses only.

Step 2. On the list of eligible faculty (Part C), encircle the four-digit identification number at the left of all those with whom you are sufficiently acquainted to make a judgment. For purposes of establishing a valid population base, it is important to encircle all with whom you are acquainted. If you have circled five or more numbers on the ballot, proceed to Step 3. Otherwise, please return your ballot as directed in Step 5.

Step 3. From the subset of faculty you have indicated in Step 2, select from one (1) to three (3) nominees. Indicate your preferences in order by placing the four-digit identification numbers of your nominees for first, second and third choices in the appropriate spaces provided in Part B.

Step 4. You are invited to furnish a short statement in support of your primary nomination. Indicate those qualities which, in your judgment, make him an outstnading teacher. Space is provided for this at the end (Part D) of the ballot.

Step 5. Place your completed ballot in the enclosed return envelope, sign the envelope and return. To be counted ballots must be received by 15 April 1972. Ballots will be separated from the envelopes.

BALLOT

Part A - Statistical (encircle code at left)

Voter Category

S Student
A Alumnus
F Faculty
C Curricular Officer

Military

Rank	Branch of Service	Curricular Area
01	N Navy	30 Ops Analysis
02	M Marine Corps	31 Aero Eng
03	A Army	32 Elec & Comm Eng
04	C Coast Guard	33 Ordnance
05	L Air Force	34 Naval Eng
06	F Foreign	35 Env Sci
07		36 Mange & Compt Sci
		37 Eng Sci
		38 Baccalaureate
		39 Def Management

Civilian

Rank	Department
IR Instructor	AE Aeronautics
AT Assist Prof	AO Aviation Safety
AC Assoc Prof	MN Bus Ad & Econ
RP Professor	EE Elec Eng
	GH Govt & Humanities
	MC Mat Sc & Chem
	MA Math
	ME Mech Eng
	MR Meteorology
	OC Oceanography
	OA Ops Analysis
	PH Physics
	NS Navy Mange Sys Center

Part B - Nominations (use the four-digit identification number)

First Choice _____ Second choice _____ Third Choice _____

Part C - List of Eligible Faculty (i.e., all faculty who taught two or more course segments in calendar year 1971, except Department Chairmen, Curricular and Liaison Officers, members of the Selection Committee and past recipients of the Award.

Aviation Safety Programs

1014 Bomberger, R. B.
1025 Bradbury, C. M.
5016 Branson, J. J.
1047 Wible, L. C.

Department of Aeronautics

5027 Bank, M. H.
1069 Bennett, J.A.J.
1070 Biblarz, O.
1081 Collins, D. J.
5038 Fuhs, A. E.
1092 Gawain, T. H.
1108 Haupt, U.
5049 Hess, R. A.
1119 Kahr, C. H.
1120 Layton, D. M.
1131 Lindsey, G. H.
1142 Miller, J. A.
1153 Netzer, D. W.
1164 Platzer, M. F.
5050 Power, H. L.
1175 Redlin, M. H.
1186 Schmidt, L. V.
1203 Zucker, R. D.

Department of Electrical Engineering

1481 Adler, R. W.
5061 Bach, R.
1508 Bauer, W. M.
1519 Baycura, O. M.
1531 Bouldry, John M.
1542 Breida, S.
1553 Campbell, J. D.
1564 Chan, S.
1575 Chaney, J. G.
1586 Cooper, P. E.
1597 Cotton, M. L.
1603 DeLaura, R. D.
1625 Ewing, Gerald D.
1636 Gardner, E. M.
1647 Geist, J. M.
1658 Gerba, A., Jr.
1669 Houston, R.K.
1670 Kirk, D. E.
1681 Klamm, C. F., Jr.
4035 Knorr, J. B.
1692 Marmont, G. H.
5072 Menneken, C. E.
1708 Miller, R. L.
1720 Myers, G. A.
5083 Myers, H. L.
1753 Panholzer, R.
4079 Powers, J. P.
4080 Powers, V. M.
5094 Price, T. G.
1764 Rahe, G. A.
1775 Rothauge, C. H.
1786 Sackman, G. L.
1797 Sheingold, A.
1803 Smith, W. C.
1814 Spaugy, D. A.
1825 Stentz, D. A.
1836 Strum, R. D.
1847 Terman, F. W.
1858 Thaler, G. J.
1869 Titus, H. A.
1870 Turner, J. B., Jr.
1881 Ward, J. R.
1892 Wilcox, M. L.

Department of Government and Humanities

1919 Amos, J. W., II
1931 Boggess, W. C.
5100 Caldwell, D. E.
1942 Gabel, B. B.
1953 Gottschalk, S.
1964 McAdams, J.M.
1986 Pearson, L. W.
1997 Smith, B. M. L.
2017 Teti, F. M.

Department of Material Science & Chemistry

2028 Clark, J. R.
5111 Edwards, G. R.
2040 Hering, C. A.
2062 Leonesio, R. B.
2051 Kinney, G. F.
2073 Reinhardt, R. A
2084 Reynolds, M. F.
2095 Rowell, C. F.
5122 Schultz, J. W.
2101 Sinclair, J. E.
2112 Tolles, W. M.
2123 Wilson, J. W.

Department of Mathematics

5133 Ault, D. A.
2134 Bender, A. P.
2145 Bleick, W. E.
2156 Bolles, R. C.
5144 Brubaker, R. H.
2167 Budway, J. J.
2189 Chewning, W. C.
2190 Comstock, C.
2206 Davis D. L.
2217 Dixon, D. R.
4057 Draper, R. A.
2228 Estell, R. J.
5155 Evans, R. M.
2239 Faulkner, F. D.
2240 Franke, R.
2251 Giarratana, J.
2262 Gibbons, G. D.
4091 Hanna, R. M.
2295 Jayachandran, T.
2301 Jennings, W.
2312 Kildall, G. A.
2323 Kodres, U. R.
2334 Kolitz, B. L.
5166 Kovach, L. D.
2367 Lucas, K. R.
2378 Marks, H. B.
2378 Morris, G. W.
2390 Pierce, J. P.
2417 Pulliam, F. M.
3971 Ramanujam, H. R.
5177 Rice, B.
2428 Roberts, A. B.
2439 Schoenstadt, A. L.
2451 Shorb, A. M.
2462 Singer, E. A.
5188 Singer S.
2473 Spalding, J. H.
2484 Stewart, E. J.
2495 Stoops, G. A.
2501 Syms, G. H.
2512 Trahan, D. H.
2523 Wang, P. C. C.
2534 Weir, M. D.
2545 Wilde, C. O.

Department of Mechanical Engineering

2552 Brock, J. E.
2567 Cantin, G.
2578 Cooper, T. E.
2589 Garrison, C. J.
2590 Houlihan, T. M.
2606 Kelleher, M. D.
2617 Marto, P. J.
2628 Newton, R. E.
2639 Nguyen, D. H.
2640 Prowell, R. W.
5199 Pucci, P. F.
2651 Salinas, D.
5200 Sarpkaya, T.
2662 Winfrey, R. C.

Department of Meteorology

2673 Alberty, R. L.
2684 Davidson, K. L.
2712 Elsberry, R. L.
2723 Hamilton, H. D.
5211 Haney, R. L.
2745 Martin, F. L.
2756 Oakes, W. B.
2767 Schardt, D. L.
2778 Taylor, C. L.
2789 Van der Biljl, W.
7001 Williams, R. T.
3915 Winninghoff, F. J.

Department of Oceanography

2806 Andrews, R. S.
2817 Bassett, C. H.
2828 Boston, N.E.J.
5222 Bourke, R. H.
2840 Denner, W. W.
2851 Galt, J. A.
2895 Jung, G. H.
5233 Knodle, W. C.
5244 Roberts, C. K.
2912 Thompson, W. C.
2923 Thornton, E. B.
2934 Traganza, E. D.
2956 von Schwind, J. J.
2967 Wickham, J. B.

Department of Operations Research and Administrative Sciences

2978 Andrus, A. F.
2989 Arima, J. K.
0066 Barden, R. S.
2990 Barr, D. R.
0105 Bedow, R. J.
3010 Brill, E. A.
3021 Butterworth, R. W.
3032 Burnett, T. D.
3043 Capra, J. R.
1214 Carrick, P. M.
1225 Church, W. H.
0077 Courtney, D.
4013 Creighton, J. W.
3054 Cunningham, W. P.
1247 Darbyshire, L.
1258 Eisenhardt, P.
1269 Elster, R. S.
3076 Esary, J. D.
3098 Floyd, J. A.
3115 Forrest, R. N.
3104 Free, W. D.
1220 Fremgen, J. J.
1281 Ganz, G.
3126 Gaver, D. P.
1292 Githens, W. H.
1308 Grainger, T. L.
3148 Greenberg, H.
4091 Hanna, M.
0011 Hauser, N.
3160 Heidorn, G. E.
3171 Higgins, J. E.
0088 Horton, F. C.
1319 Hoverland, H. A.
3182 Howard, G. T.
1320 Hynes, J. P.
1331 Jolly, J. A.
0099 King, G. J.
3948 Kline, M. B.
1353 Lande, R. S.
1364 Lane, H. L.
3232 Larson, H. J.
1375 Lee, M. H.
3243 Lindsay, G. F.
3265 Marshall, K. T.
1386 McDonald, J. H.
3254 McMasters, A. W.
3276 Milch, P. R.
3287 Peterson, C. A.
3298 Poock, G. K.
3304 Preston, F. L.
0116 Raike, W. M.
3937 Read, R. R.
3315 Richards, F. R.
4046 Schneidewind, N. F.
3326 Schrady, D. A.
0127 Senger, J. D.
3348 Shubert, B. O.
3359 Shudde, R. H.
0138 Sontheimer, K.
3360 Sovereign, M. G.
1425 Steckler, M. J.
3382 Taylor, J. G.
0149 Thomas, M. U.
3409 Tysver, J. B.
3960 Uhler, R. S.
3410 Washburn, A. R.
0150 Wassenaar, D. J.
1458 Wegener, W. H.
0161 Weitzman, R. A.
0172 Whipple, D.
1470 Womer, N. K.
3421 Woods, W. M.
3432 Zehna, P. W.
3443 Zweig, H. J.

Department of Physics

3454 Armstead, R. L.
3465 Buskirk, F. R.
3476 Ceglio, N. M.
3487 Cooper, A. W.
3498 Cooper, J. N.
3504 Coopens, A. B.
3515 Crittenden, E.C.,Jr.
3526 Dahl, H. A.
0183 Dally, E. B.
3537 Eller, A. I.
3548 Garrettson, G. A.
3559 Handler, H. E.
3560 Harrison, D. E., Jr.
3571 Kalmbach, S. H.
3582 Kelley, R. L.
3609 Lipes, R. G.
3610 Little, W.
0194 Maruyama, X. K.
3621 Medwin, H.
3632 Milne, E. A.
3643 Neighbours, J. R.
3654 Olsen, L. O.
3665 Reese, W.
3676 Riggin, J. D.
3687 Rodeback, G. W.
3698 Sanders, J. V.
3704 Schacher, G. E.
3715 Schwirzke, F. R.
3726 Williamson, T. J.
7012 Wilson, O. B., Jr.
3737 Woehler, K. E.
3748 Zeleny, W. B.

Navy Management Systems Center

3759 Blandin, Sherman W.
3760 Boynton, R. E.
0200 Callahan, J. F.
0211 Campbell, W. A.
3782 Childs, F. E.
3793 Dawson, J. E.
3809 DeSerpa, A. C.
3810 Doran, E. J.
3821 Freed, E. J.
3854 Mauer, W. A.
3865 Plotkin, N.
3876 Puscheck, H. C.
3898 Ulrey, I. W.
3887 von Pagenhardt, R.
3904 Wood, C. L.

Part D - Supporting remarks for your primary nomination (optional)

APPENDIX B

PROGRAM 1 TRANSFER

```
//   EXEC  COBFCLG
//COB.SYSIN DD *
       IDENTIFICATION DIVISION.
       PROGRAM-ID. 'TRANSFER'.
       AUTHOR. K.M.EISENHARDT.
       DATE-WRITTEN. APRIL,1970.
       INSTALLATION. NPS-MONTEREY.
       REMARKS.  TRANSFER PLACES THE CARD IMAGES OF EACH
                 BALLOT ON A TAPE AND CHECKS FOR KEYPUNCH ERRORS.
       ENVIRONMENT DIVISION.
       CONFIGURATION SECTION.
       SOURCE-COMPUTER. IBM-360-67.
       OBJECT-COMPUTER. IBM-360-67.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT CARD-FILE ASSIGN TO 'CARD' UTILITY.
           SELECT BALLOT-FILE ASSIGN TO 'BALLOT' UTILITY.
       DATA DIVISION.
       FILE SECTION.
       FD  CARD-FILE
           LABEL RECORD IS OMITTED
           RECORDING MODE IS F
           RECORD CONTAINS 80 CHARACTERS
           DATA RECORDS ARE BALLOT, BALLOT-CONT.
       01  BALLOT.
           02  STATISTICS.
               03  NUMBER                          PICTURE XXXX.
               03  VOTER                           PICTURE X.
               03  FILLER                          PICTURE X.
               03  MIL-RANK                        PICTURE XX.
               03  SERVICE                         PICTURE X.
               03  CURRICULUM                      PICTURE XX.
               03  ACAD-RANK                       PICTURE XX.
               03  DEPT                            PICTURE XX.
               03  COMMENT                         PICTURE X.
           02  INITIAL.
               03  A                               PICTURE 9.
               03  B                               PICTURE 9.
               03  C                               PICTURE 9.
```

```
           03  D                                  PICTURE 9.
       02  SECOND.
           03  A                                  PICTURE 9.
           03  B                                  PICTURE 9.
           03  C                                  PICTURE 9.
           03  D                                  PICTURE 9.
       02  THIRD.
           03  A                                  PICTURE 9.
           03  B                                  PICTURE 9.
           03  C                                  PICTURE 9.
           03  D                                  PICTURE 9.
       02  PROF       OCCURS 12 TIMES.
           03  ELEMENT OCCURS 4 TIMES             PICTURE 9.
       02  FILLER                                 PICTURE XXXX.
01     BALLOT-CONT.
       02  NUMBER                                 PICTURE XXXX.
       02  CONTINUE                               PICTURE X.
       02  FILLER                                 PICTURE X.
       02  POP        OCCURS 17 TIMES.
           03  EL OCCURS 4 TIMES                  PICTURE 9.
       02  FILLER                                 PICTURE XXXXXX.
FD     BALLOT-FILE
       LABEL RECORD IS OMITTED
       RECORDING MODE IS F
       BLOCK CONTAINS 3 RECORDS
       RECORD CONTAINS 477 CHARACTERS
       DATA RECORD IS BALLOT-RECORD.
01     BALLOT-RECORD.
       02  NUMBER                                 PICTURE XXXX.
       02  STATISTICS.
           03  VOTER                              PICTURE X.
           03  MIL-RANK                           PICTURE XX.
           03  SERVICE                            PICTURE X.
           03  CURRICULUM                         PICTURE XX.
           03  ACAD-RANK                          PICTURE XX.
           03  DEPT                               PICTURE XX.
           03  COMMENT                            PICTURE X.
       02  ONE                                    PICTURE XXX.
       02  TWO                                    PICTURE XXX.
       02  THREE                                  PICTURE XXX.
       02  M                                      PICTURE 999.
       02  POPULATION  OCCURS 150 TIMES           PICTURE XXX.
WORKING-STORAGE SECTION.
77     I                                           PICTURE 999.
77     CHECK                                       PICTURE XXXX.
77     TEST                                        PICTURE 9.
77     ALPHA                                       PICTURE X.
77     CNTR          PICTURE 9999                  VALUE 0.
```

```
PROCEDURE DIVISION.
PREPARATION-SECTION.
    OPEN INPUT CARD-FILE,
         OUTPUT BALLOT-FILE.
INITIAL-CARD-SECTION.
    READ CARD-FILE RECORD AT END GO TO COMPLETION-SECTION.
ENTRY-1.
    MOVE NUMBER IN BALLOT TO CHECK.
    MOVE SPACES TO BALLOT-RECORD.
    MOVE 0 TO M.
STATISTICS-VERIFICATION.
M1.
    IF MIL-RANK IN BALLOT IS GREATER THAN '00' AND LESS
    THAN '08' THEN GO TO M2.
    IF MIL-RANK IN BALLOT IS EQUAL TO SPACES THEN GO TO M2.
    DISPLAY 'MIL-RANK        INCORRECT - BALLOT' CHECK.
    GO TO FIND-NEXT-BALLOT-1.
M2.
    IF SERVICE IN BALLOT IS EQUAL TO 'N' THEN GO TO M3.
    IF SERVICE IN BALLOT IS EQUAL TO 'M' THEN GO TO M3.
    IF SERVICE IN BALLOT IS EQUAL TO 'C' THEN GO TO M3.
    IF SERVICE IN BALLOT IS EQUAL TO 'A' THEN GO TO M3.
    IF SERVICE IN BALLOT IS EQUAL TO 'F' THEN GO TO M3.
    IF SERVICE IN BALLOT IS EQUAL TO 'L' THEN GO TO M3.
    IF SERVICE IN BALLOT IS EQUAL TO SPACES THEN GO TO M3.
    DISPLAY 'SERVICE         INCORRECT - BALLOT' CHECK.
    GO TO FIND-NEXT-BALLOT-1.
M3.
    IF CURRICULUM IN BALLOT IS GREATER THAN '29' AND LESS THAN
    '40' THEN GO TO M4.
    IF CURRICULUM IN BALLOT IS EQUAL TO SPACES THEN GO TO M4.
    DISPLAY 'CURRICULUM      INCORRECT - BALLOT' CHECK.
    GO TO FIND-NEXT-BALLOT-1.
M4.
    IF VOTER IN BALLOT IS EQUAL TO 'S' THEN GO TO BRANCH-JOINT.
    IF VOTER IN BALLOT IS EQUAL TO 'F' THEN GO TO FACULTY.
    IF VOTER IN BALLOT IS EQUAL TO 'A' THEN GO TO BRANCH-JOINT.
    IF VOTER IN BALLOT IS EQUAL TO 'C' THEN GO TO BRANCH-JOINT.
    IF VOTER IN BALLOT IS EQUAL TO SPACES
    THEN GO TO BRANCH-JOINT.
    DISPLAY 'VOTER           INCORRECT - BALLOT' CHECK.
    GO TO FIND-NEXT-BALLOT-1.
FACULTY.
    IF ACAD-RANK IN BALLOT IS EQUAL TO 'AT' THEN GO TO F4.
    IF ACAD-RANK IN BALLOT IS EQUAL TO 'AC' THEN GO TO F4.
    IF ACAD-RANK IN BALLOT IS EQUAL TO 'IR' THEN GO TO F4.
    IF ACAD-RANK IN BALLOT IS EQUAL TO 'PR' THEN GO TO F4.
    IF ACAD-RANK IN BALLOT IS EQUAL TO SPACES THEN GO TO F4.
```

```
    DISPLAY 'ACAD-RANK      INCORRECT - BALLOT' CHECK.
    GO TO FIND-NEXT-BALLOT-1.
F4.
    IF DEPT IN BALLOT IS EQUAL TO 'MN' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'EE' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'MA' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'OA' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'PH' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'AE' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'MR' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'ME' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'OC' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'NS' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'MC' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'GH' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO 'AO' THEN GO TO BRANCH-JOINT.
    IF DEPT IN BALLOT IS EQUAL TO SPACES THEN GO TO BRANCH-JOINT.
    DISPLAY 'DEPT           INCORRECT - BALLOT' CHECK.
    GO TO FIND-NEXT-BALLOT-1.
BRANCH-JOINT.
    IF COMMENT IN BALLOT IS EQUAL TO '0' OR '1' THEN GO TO
    DIGIT-CHECK-1.
    DISPLAY 'COMMENT        INCORRECT - BALLOT' CHECK.
    GO TO FIND-NEXT-BALLOT-1.
DIGIT-CHECK-1.
    MOVE INITIAL TO ONE.
    IF ONE IS EQUAL TO SPACES THEN GO TO C1.
    MULTIPLY 3.0 BY A IN INITIAL.
    MULTIPLY 5.0 BY B IN INITIAL.
    ADD A IN INITIAL, B IN INITIAL, C IN INITIAL GIVING TEST.
    IF TEST IS NOT EQUAL TO D IN INITIAL
    THEN DISPLAY 'INITIAL          INCORRECT - BALLOT' CHECK,
    GO TO FIND-NEXT-BALLOT-1.
C1.
    MOVE SECOND TO TWO.
    IF TWO IS EQUAL TO SPACES THEN GO TO C2.
    MULTIPLY 3.0 BY A IN SECOND.
    MULTIPLY 5.0 BY B IN SECOND.
    ADD A IN SECOND, B IN SECOND, C IN SECOND GIVING TEST.
    IF TEST IS NOT EQUAL TO D IN SECOND
    THEN DISPLAY 'SECOND           INCORRECT - BALLOT' CHECK,
    GO TO FIND-NEXT-BALLOT-1.
C2.
    MOVE THIRD TO THREE.
    IF THREE IS EQUAL TO SPACES THEN GO TO MOVE-1.
    MULTIPLY 3.0 BY A IN THIRD.
    MULTIPLY 5.0 BY B IN THIRD.
    ADD A IN THIRD, B IN THIRD, C IN THIRD GIVING TEST.
```

```
    IF TEST IS NOT EQUAL TO D IN THIRD
    THEN DISPLAY 'THIRD          INCORRECT - BALLOT' CHECK,
    GO TO FIND-NEXT-BALLOT-1.
MOVE-1.
    MOVE CORRESPONDING STATISTICS IN BALLOT TO STATISTICS
    IN BALLOT-RECORD.
    MOVE NUMBER IN BALLOT TO NUMBER IN BALLOT-RECORD.
    MOVE 0 TO I.
LOOP-1.
    ADD 1 TO I.
    MOVE ELEMENT (I, 1) TO ALPHA.
    IF ALPHA IS EQUAL TO SPACES THEN GO TO WRITE-TAPE.
    ADD 1 TO M.
    MOVE PROF (I) TO POPULATION (M).
    MULTIPLY 3.0 BY ELEMENT (I, 1).
    MULTIPLY 5.0 BY ELEMENT (I, 2).
    ADD ELEMENT (I, 1), ELEMENT (I, 2), ELEMENT (I, 3)
    GIVING TEST.
    IF TEST IS EQUAL TO ELEMENT (I, 4) THEN GO TO DUMMY-1.
    DISPLAY 'DIGIT ERROR       ' M '       BALLOT'
    NUMBER IN BALLOT.
FIND-NEXT-BALLOT-1.
    READ CARD-FILE RECORD AT END GO TO COMPLETION-SECTION.
    IF NUMBER IN BALLOT IS EQUAL TO CHECK THEN
    GO TO FIND-NEXT-BALLOT-1.
    GO TO ENTRY-1.
DUMMY-1.
    IF I IS NOT EQUAL TO 12 GO TO LOOP-1.
CONTINUATION-CARD-SECTION.
    READ CARD-FILE AT END GO TO COMPLETION-SECTION.
    IF NUMBER IN BALLOT IS NOT EQUAL TO CHECK GO TO ROUTE.
    MOVE 0 TO I.
LOOP-2.
    ADD 1 TO I.
    MOVE EL (I, 1) TO ALPHA.
    IF ALPHA IS EQUAL TO SPACES GO TO WRITE-TAPE.
    ADD 1 TO M.
    MOVE POP (I) TO POPULATION (M).
    MULTIPLY 3.0 BY EL (I, 1).
    MULTIPLY 5.0 BY EL (I, 2).
    ADD EL (I, 1), EL (I, 2), EL (I, 3) GIVING TEST.
    IF TEST IS EQUAL TO EL (I, 4) THEN GO TO DUMMY-2.
    DISPLAY 'DIGIT ERROR       ' M '       BALLOT'
    NUMBER IN BALLOT.
FIND-NEXT-BALLOT-2.
    READ CARD-FILE AT END GO TO COMPLETION-SECTION.
    IF NUMBER IN BALLOT IS EQUAL TO CHECK THEN
    GO TO FIND-NEXT-BALLOT-2.
```

```
            GO TO ENTRY-1.
        DUMMY-2.
            IF I IS EQUAL TO 17 GO TO CONTINUATION-CARD-SECTION.
            GO TO LOOP-2.
        ROUTE.
            IF VOTER IN BALLOT IS NOT EQUAL TO 'X' THEN ADD 1 TO CNTR,
            WRITE BALLOT-RECORD, GO TO ENTRY-1.
        ROUTE-2.
            IF VOTER IN BALLOT IS NOT EQUAL TO 'X' THEN GO TO ENTRY-1.
            DISPLAY 'SEQUENCE ERROR    ' NUMBER IN BALLOT
            '     BALLOT' CHECK.
            READ CARD-FILE RECORD AT END GO TO COMPLETION-SECTION.
            GO TO ROUTE-2.
        WRITE-TAPE.
            ADD 1 TO CNTR.
            WRITE BALLOT-RECORD.
            GO TO INITIAL-CARD-SECTION.
        COMPLETION-SECTION.
            DISPLAY 'NUMBER OF BALLOTS ADDED TO TAPE    ' CNTR.
            CLOSE CARD-FILE, BALLOT-FILE.
            STOP RUN.
//GO.BALLOT   DD   DSNAME=BALL,UNIT=2400,VOL=SER=SCRATC,LABEL=(,NL),    *
//      DISP=(NEW,KEEP),DCB=(RECFM=FB,LRECL=477,BLKSIZE=1431)
//GC.CARD      DD  *,DCB=BLKSIZE=80
```

PROGRAM 2 PROFSORT

```
//     EXEC   COBFCLG,REGION.GO=110K,TIME.GO=2
//COB.SYSIN    DD  *
       IDENTIFICATION DIVISION.
       PROGRAM-ID. 'PROFSORT'.
       AUTHOR. K.M.EISENHARDT.
       INSTALLATION. NPGS-MONTEREY.
       DATE-WRITTEN. APRIL, 1970.
       REMARKS. PROFSORT BUILDS PROF-FILE WHICH IS ORGANIZED BY
                ASCENDING PROF-NUMBER FROM BALLOT-FILE WHICH IS
                RANDOMLY ORGANIZED BY BALLOT.
       ENVIRONMENT DIVISION.
       CONFIGURATION SECTION.
       SOURCE-COMPUTER. IBM-360-67.
       OBJECT-COMPUTER. IBM-360-67.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT BALLOT-FILE ASSIGN TO 'BALLOT' UTILITY.
           SELECT PROF-FILE ASSIGN TO 'SORTOUT' UTILITY.
           SELECT GRAPH-FILE ASSIGN TO 'GRAPH' UTILITY.
       DATA DIVISION.
       FILE SECTION.
       FD  BALLOT-FILE
           LABEL RECORDS ARE OMITTED
           RECORDING MODE IS F
           BLOCK CONTAINS 3 RECORDS
           RECORD CONTAINS 477 CHARACTERS
           DATA RECORD IS BALLOT-RECORD.
       01  BALLOT-RECORD.
           02  NUMBER                              PICTURE XXXX.
           02  STATISTICS.
               03  VOTER                           PICTURE X.
               03  MIL-RANK                        PICTURE XX.
               03  SERVICE                         PICTURE X.
               03  CURRICULUM                      PICTURE XX.
               03  ACAD-RANK                       PICTURE XX.
               03  DEPT                            PICTURE XX.
               03  COMMENT                         PICTURE 9.
           02  ONE                                 PICTURE XXX.
           02  TWO                                 PICTURE XXX.
           02  THREE                               PICTURE XXX.
           02  M                                   PICTURE 999.
           02  POPULATION  OCCURS 150 TIMES        PICTURE XXX.
       FD  PROF-FILE
           LABEL RECORDS ARE OMITTED
           RECORDING MODE IS F
```

```
     BLOCK CONTAINS 50 RECORDS
     RECORD CONTAINS 22 CHARACTERS
     DATA RECORD IS PROF-RECORD.
01   PROF-RECORD.
     02  BALLOT-NUMBER                    PICTURE XXXX.
     02  PROF.
         03  NUMBER                       PICTURE XXX.
         03  VOTE                         PICTURE 9.
         03  COMMENT                      PICTURE 9.
     02  VOTER.
         03  CATEGORY                     PICTURE X.
         03  MILITARY.
             04  RANK                     PICTURE XX.
             04  SERVICE                  PICTURE X.
             04  CURRICULUM               PICTURE XX.
         03  CIVILIAN.
             04  RANK                     PICTURE XX.
             04  DEPT                     PICTURE XX.
     02  M-TOTAL                          PICTURE 999.
FD   GRAPH-FILE
     LABEL RECORDS ARE OMITTED
     RECORDING MODE IS F
     BLOCK CONTAINS 25 RECORDS
     RECORD CONTAINS 133 CHARACTERS
     DATA RECORD IS GRAPH-RECORD.
01   GRAPH-RECORD.
     02  GRAPH      OCCURS 133 TIMES      PICTURE X.
SD   SORT-FILE
     RECORDING MODE IS F
     RECORD CONTAINS 22 CHARACTERS
     DATA RECORD IS SORT-RECORD.
01   SORT-RECORD.
     02  BALLOT-SORT                      PICTURE XXXX.
     02  PROF-SORT                        PICTURE XXX.
     02  VOTE-SORT                        PICTURE 9.
     02  COMMENT-SORT                     PICTURE 9.
     02  STATISTICS-SORT.
         03  VOTER                        PICTURE X.
         03  MIL-RANK                     PICTURE XX.
         03  SERVICE                      PICTURE X.
         03  CURRICULUM                   PICTURE XX.
         03  ACAD-RANK                    PICTURE XX.
         03  DEPT                         PICTURE XX.
     02  M-SORT                           PICTURE 999.
WORKING-STORAGE SECTION.
77   CNTR     PICTURE 9999    COMPUTATIONAL-3     VALUE 0000.
77   INDEX    PICTURE 999999  COMPUTATIONAL-3     VALUE 000000.
77   K                PICTURE 99                  VALUE 00.
```

```
77  J                       PICTURE 9          VALUE 0.
77  I                                          PICTURE 999.
77  M-MEAN  PICTURE  99999  VALUE 00000.
77  M-VAR   PICTURE 999999  VALUE 000000.
77  MEAN                                      PICTURE ZZ9.99999.
77  VAR                                       PICTURE ZZ9.99999.
77  DODO                                      PICTURE 999V99999.
77  DUMDUM                                    PICTURE 999V99999.
77  SCRIPT                                    PICTURE 999.
01  VARIABLES.
    02  POINTS   OCCURS 133 TIMES             PICTURE 999.
PROCEDURE DIVISION.
    SORT SORT-FILE ON ASCENDING KEY PROF-SORT,
    INPUT PROCEDURE INITIAL,
    GIVING PROF-FILE.
    STOP RUN.
INITIAL SECTION.
    OPEN INPUT BALLOT-FILE,
         OUTPUT GRAPH-FILE.
    MOVE ZEROES TO VARIABLES.
    MOVE SPACES TO GRAPH-RECORD.
    MOVE '
-   'FREQUENCY DISTRIBUTION OF M' TO GRAPH-RECORD.
    WRITE GRAPH-RECORD AFTER ADVANCING 0 LINES.
    MOVE SPACES TO GRAPH-RECORD.
    MOVE '          0         10        20        30        40
-   '    50        60        70        80        90        100'
    TO GRAPH-RECORD.
    WRITE GRAPH-RECORD AFTER ADVANCING 2 LINES.
    MOVE SPACES TO GRAPH-RECORD.
    MOVE '          CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
-   'CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
-   'CC' TO GRAPH-RECORD.
    WRITE GRAPH-RECORD AFTER ADVANCING 1 LINES.
READ-BALLOT-FILE.
    READ BALLOT-FILE RECORD AT END GO TO COMPLETION.
    DISPLAY 'BALLOD NUM ', NUMBER IN BALLOT-RECORD.
    DISPLAY 'M IN ABOVE REC ', M.
    ADD 1 TO CNTR.
    MOVE 0 TO I.
    PERFORM LOOP THRU LOOPEND M TIMES.
    DISPLAY 'VALUE OF M= ', M.
    ADD 1 TO POINTS (M).
    ADD M TO M-MEAN.
    COMPUTE M-VAR ROUNDED = M * M + M-VAR.
    GO TO READ-BALLOT-FILE.
LOOP.
    ADD 1 TO I.
```

```
           MOVE SPACES TO SORT-RECORD.
           MOVE POPULATION (I) TO PROF-SORT.
           MOVE NUMBER IN BALLOT-RECORD TO BALLOT-SORT.
           MOVE 0 TO VOTE-SORT.
           MOVE 0 TO COMMENT-SORT.
           MOVE CORRESPONDING STATISTICS TO STATISTICS-SORT.
           MOVE M TO M-SORT.
           IF POPULATION (I) IS EQUAL TO ONE
               THEN MOVE 3 TO VOTE-SORT, MOVE COMMENT IN BALLOT-RECORD
               TO COMMENT-SORT, GO TO LOOPEND.
           IF POPULATION (I) IS EQUAL TO TWO
               THEN MOVE 2 TO VOTE-SORT, GO TO LOOPEND.
           IF POPULATION (I) IS EQUAL TO THREE
               THEN MOVE 1 TO VOTE-SORT.
       LOOPEND.
           ADD 1 TO INDEX.
           RELEASE SORT-RECORD.
       GRAPH-ROUTINE.
           MOVE SPACES TO GRAPH-RECORD.
           ADD 1 TO K.
           IF K IS NOT EQUAL TO 10 THEN GO TO GRAPH-CONT.
           MOVE ZERO TO K.
           IF J IS EQUAL TO 9 THEN GO TO GRAPH-CONT.
           ADD 1 TO J.
           MOVE J TO GRAPH (8).
           MOVE '5' TO GRAPH (9).
       GRAPH-CONT.
           MOVE '0' TO GRAPH (10).
           ADD 10, POINTS (I) GIVING SCRIPT.
           MOVE '*' TO GRAPH (SCRIPT).
           WRITE GRAPH-RECORD AFTER ADVANCING 1 LINES.
       COMPLETION.
           MOVE SPACES TO GRAPH-RECORD.
           MOVE 5 TO I.
           PERFORM GRAPH-CONT.
           PERFORM GRAPH-ROUTINE THRU GRAPH-CONT VARYING I FROM 6
           BY 1 UNTIL I IS EQUAL TO 130.
           DISPLAY 'TOTAL INPUT RECORDS     ' CNTR.
           DISPLAY 'TOTAL SORTED RECORDS    ' INDEX.
           DIVIDE CNTR INTO M-MEAN GIVING DODO ROUNDED.
           DIVIDE CNTR INTO M-VAR GIVING DUMDUM ROUNDED.
           COMPUTE DUMDUM ROUNDED = DUMDUM - DODO * DODO.
           MOVE DUMDUM TO VAR.
           MOVE DODO TO MEAN.
           DISPLAY 'M-MEAN          ' MEAN.
           DISPLAY 'M-VAR           ' VAR.
           COMPUTE VAR ROUNDED = DUMDUM ** 0.5.
           DISPLAY 'SDN             ' VAR.
```

```
           CLOSE BALLOT-FILE, GRAPH-FILE.
//GO.SORTPR  DD  SYSOUT=A
//GO.SYSOUT  DD  SYSOUT=A
//GO.SORTLIB DD DSNAME=SYS1.SORTLIB,DISP=OLD
//GO.SORTWK01 DD UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK02 DD UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK03 DD UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK04 DD UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK05 DD UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK06 DD UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.BALLOT  DD  DSNAME=BALL,UNIT=2400,VOL=SER=SCRATC,LABEL=(,NL),      *
//        DISP=(OLD,KEEP),DCB=(RECFM=FB,LRECL=477,BLKSIZE=1431)         *
//GO.SORTOUT DD DSNAME=PRO,UNIT=2400,VOL=SER=NPS115,LABEL=(,SL),        *
//    DISP=(OLD,KEEP),DCB=(RECFM=FB,LRECL=22,BLKSIZE=1100)
//GO.GRAPH   DD  SYSOUT=A,DCB=(RECFM=FB,LRECL=133,BLKSIZE=3325)
```

PROGRAM 3 SCORSORT

```
//     EXEC   COBFCLG,REGION.GO=125K,TIME.GO=2
//COB.SYSIN    DD  *
        IDENTIFICATION DIVISION.
        PROGRAM-ID. 'SCORSORT'.
        AUTHOR. K.M.EISENHARDT.
        INSTALLATION. NPGS-MONTEREY.
        DATE-WRITTEN. APRIL,1970.
        REMARKS. SCORSORT COMPUTES THE EXCELLENCE SCORE OF EACH PROFESSOR
                 AND ORGANIZES THESE RESULTS BY DESCENDING SCORE AND
                 DESCENDING NUMBER OF ACQUAINTENCES.
        ENVIRONMENT DIVISION.
        CONFIGURATION SECTION.
        SOURCE-COMPUTER. IBM-360-67.
        OBJECT-COMPUTER. IBM-360-67.
        INPUT-OUTPUT SECTION.
        FILE-CONTROL.
            SELECT PROF-FILE ASSIGN TO 'PROF' UTILITY.
            SELECT SCOR-FILE ASSIGN TO 'SCORE' UTILITY.
            SELECT GRAPH-FILE ASSIGN TO 'GRAPH' UTILITY.
        DATA DIVISION.
        FILE SECTION.
        FD  PROF-FILE
            LABEL RECORDS ARE OMITTED
            RECORDING MODE IS F
            BLOCK CONTAINS 50 RECORDS
            RECORD CONTAINS 22 CHARACTERS
            DATA RECORD IS PROF-RECORD.
        01  PROF-RECORD.
            02  FILLER                          PICTURE XXXX.
            02  PROF.
                03  NUMBER                      PICTURE XXX.
                03  VOTE                        PICTURE 9.
                03  COMMENT                     PICTURE 9.
            02  VOTER.
                03  CATEGORY                    PICTURE X.
                03  MILITARY.
                    04  RANK                    PICTURE XX.
                    04  SERVICE                 PICTURE X.
                    04  CURRICULUM              PICTURE XX.
                03  CIVILIAN.
                    04  RANK                    PICTURE XX.
                    04  DEPT                    PICTURE XX.
            02  M-TOTAL                         PICTURE 999.
        FD  SCOR-FILE
            LABEL RECORDS ARE OMITTED
```

```
     RECORDING MODE IS F
     BLOCK CONTAINS 25 RECORDS
     RECORD CONTAINS 133 CHARACTERS
     DATA RECORD ARE SCOR-RECORD, HEADING-RECORD.
01   SCOR-RECORD.
     02   FILLER                                  PICTURE X(6).
     02   PROF                                    PICTURE XXX.
     02   FILLER                                  PICTURE X(10).
     02   CALCULATIONS.
          03   SK                                 PICTURE 9.99999.
          03   FILLER                            PICTURE XXX.
          03   NK                                 PICTURE ZZ9.
          03   FILLER                            PICTURE XXX.
          03   ZK                                 PICTURE ZZ9.
          03   FILLER                            PICTURE XXX.
          03   DK                                 PICTURE ZZ9.
          03   FILLER                            PICTURE X(6).
          03   X1K                                PICTURE ZZ9.
          03   FILLER                            PICTURE XXX.
          03   X2K                                PICTURE ZZ9.
          03   FILLER                            PICTURE XXX.
          03   X3K                                PICTURE ZZ9.
          03   FILLER                            PICTURE X(6).
          03   DIFF                              PICTURE ZZ9.
          03   FILLER                            PICTURE XXX.
          03   ESK                               PICTURE 9.999.
          03   FILLER                            PICTURE XXX.
          03   SDSK                              PICTURE 9.999.
          03   FILLER                            PICTURE XXX.
          03   QUO                               PICTURE ----.999.
          03   FILLER                            PICTURE X(32).
01   HEADING-RECORD.
     02   HEADER-FIELDS                           PICTURE X(133).
FD   GRAPH-FILE
     LABEL RECORDS ARE OMITTED
     RECORDING MODE IS F
     BLOCK CONTAINS 25 RECORDS
     RECORD CONTAINS 133 CHARACTERS
     DATA RECORD IS GRAPH-RECORD.
01   GRAPH-RECORD.
     02   GRAPH        OCCURS 133 TIMES          PICTURE X.
SD   SORT-FILE
     RECORDING MODE IS F
     RECORD CONTAINS 45 CHARACTERS
     DATA RECORD IS SORT-RECORD.
01   SORT-RECORD.
     02   PROF-SORT                               PICTURE XXX.
     02   VOTER-SORT.
```

```
           03  CATEGORY-SORT                    PICTURE X.
           03  MILITARY-SORT.
               04  RANK                         PICTURE XX.
               04  SERVICE                      PICTURE X.
               04  CURRICULUM                   PICTURE XX.
           03  CIVILIAN-SORT.
               04  RANK                         PICTURE XX.
               04  DEPT                         PICTURE XX.
       02  SK-SORT                              PICTURE  9V99999.
       02  NK-SORT                              PICTURE 999.
       02  ZK-SORT                              PICTURE 999.
       02  DK-SORT                              PICTURE 999.
       02  X1K-SORT                             PICTURE 999.
       02  X2K-SORT                             PICTURE 999.
       02  X3K-SORT                             PICTURE 999.
       02  ESK-SORT                             PICTURE 9V999.
       02  SDSK-SORT                            PICTURE 9V999.
WORKING-STORAGE SECTION.
77  CNTR                  PICTURE 999999     COMPUTATIONAL-3.
77  INDEX                 PICTURE 999        COMPUTATIONAL-3.
77  DUMMY                 PICTURE 9V999      COMPUTATIONAL-3.
77  DODO                  PICTURE 9999V9999  COMPUTATIONAL-3.
77  DUMDUM                PICTURE 9999V9999  COMPUTATIONAL-3.
77  DOPEY                                    PICTURE 999.
77  I                                         PICTURE 999.
77  SCRIPT                                   PICTURE 999.
77  MEAN                                     PICTURE ZZZ9.999.
77  VAR                                      PICTURE ZZZ9.999.
77  N-VAR                 PICTURE 999999     VALUE 000000.
77  N-MEAN                PICTURE 999999     VALUE 000000.
77  K                      PICTURE 99         VALUE 00.
77  J                      PICTURE 9          VALUE 0.
77  WEIGHT-FIRST          PICTURE 9          VALUE 4.
77  WEIGHT-SECOND         PICTURE 9          VALUE 2.
77  WEIGHT-THIRD          PICTURE 9          VALUE 1.
01  GRAPH-AID.
    02  POINTS  OCCURS 500 TIMES              PICTURE 999.
01  IDS.
    02  IDENT                                 PICTURE XXX.
    02  IDENT-NUM  REDEFINES IDENT            PICTURE 999.
01  VARIABLES.
    02  X   OCCURS 4 TIMES                    PICTURE 999.
01  HEADING-FORMAT.
    02  FILLER              PICTURE X(6)      VALUE SPACES.
    02  PROF                PICTURE XXXX      VALUE 'PROF'.
    02  FILLER              PICTURE X(10)     VALUE SPACES.
    02  S                   PICTURE X(7)      VALUE ' SCORE '.
    02  FILLER              PICTURE XXX       VALUE SPACES.
```

```
           02  N                      PICTURE XXX        VALUE 'NK '.
           02  FILLER                 PICTURE XXX        VALUE SPACES.
           02  Z                      PICTURE XXX        VALUE 'ZK '.
           02  FILLER                 PICTURE XXX        VALUE SPACES.
           02  D                      PICTURE XXX        VALUE 'DK '.
           02  FILLER                 PICTURE X(6)       VALUE SPACES.
           02  X1                     PICTURE XXX        VALUE 'X1K'.
           02  FILLER                 PICTURE XXX        VALUE SPACES.
           02  Y                      PICTURE XXX        VALUE 'X2K'.
           02  FILLER                 PICTURE XXX        VALUE SPACES.
           02  Z                      PICTURE XXX        VALUE 'X3K'.
           02  FILLER                 PICTURE X(6)       VALUE SPACES.
           02  DI                     PICTURE XXX        VALUE 'DIF'.
           02  FILLER                 PICTURE XXX        VALUE SPACES.
           02  E                      PICTURE XXX        VALUE 'ESK'.
           02  FILLER                 PICTURE XXXX       VALUE SPACES.
           02  SDS                    PICTURE X(5)       VALUE 'SDSK '.
           02  FILLER                 PICTURE XXX        VALUE SPACES.
           02  Q                      PICTURE X(5)       VALUE 'QUOT '.
           02  FILLER                 PICTURE X(34)      VALUE SPACES.
       PROCEDURE DIVISION.
           SORT SORT-FILE ON DESCENDING KEY SK-SORT,
           DESCENDING KEY NK-SORT,
           INPUT PROCEDURE INITIAL,
           OUTPUT PROCEDURE FINISH.
           STOP RUN.
       INITIAL SECTION.
           OPEN INPUT PROF-FILE,
           OUTPUT GRAPH-FILE, SCOR-FILE.
           MOVE ZEROES TO GRAPH-AID.
           MOVE ZERO TO CNTR.
           MOVE ZERO TO INDEX.
       PRINT-GRAPH-HEADING-AND-GRID.
           MOVE SPACES TO GRAPH-RECORD.
           MOVE '
      -    'FREQUENCY DISTRIBUTION OF NK' TO GRAPH-RECORD.
           WRITE GRAPH-RECORD AFTER ADVANCING 0 LINES.
           MOVE SPACES TO GRAPH-RECORD.
           MOVE '         0         10        20        30        40
      -    '    50' TO GRAPH-RECORD.
           WRITE GRAPH-RECORD AFTER ADVANCING 2 LINES.
           MOVE SPACES TO GRAPH-RECORD.
           MOVE '          0000000000000000000000000000000000000000000000000
      -    '0000000000000000000000000000000000000000000000000000000000000000
      -    '00' TO GRAPH-RECORD.
           WRITE GRAPH-RECORD AFTER ADVANCING 1 LINES.
       READ-INITIAL-PROF-RECORD.
           READ PROF-FILE RECORD AT END GO TO COMPLETION.
```

```
           ADD 1 TO CNTR.
           MOVE ZEROES TO SORT-RECORD.
           MOVE ZEROES TC VARIABLES.
           MOVE NUMBER TO IDENT.
           GO TO INTERMEDIATE-CALCULATIONS.
       READ-PROF-FILE.
           READ PROF-FILE RECORD AT END GO TO COMPLETION.
           ADD 1 TO CNTR.
           IF NUMBER IS NCT EQUAL TO IDENT GO TO RESULT-CALCULATIONS.
       INTERMEDIATE-CALCULATIONS.
           ADD COMMENT TO DK-SORT.
           ADD 1 TO NK-SORT
           IF VOTE IS EQUAL TO 3 ADD WEIGHT-FIRST TO ZK-SORT.
           IF VOTE IS EQUAL TO 2 ADD WEIGHT-SECOND TO ZK-SORT.
           IF VOTE IS EQUAL TO 1 ADD WEIGHT-THIRD TO ZK-SORT.
           ADD 1 TO VOTE.
           ADD 1 TO X (VOTE).
           DIVIDE M-TOTAL INTO 1.0 GIVING DUMMY ROUNDED.
           ADD DUMMY TC ESK-SORT.
           COMPUTE SDSK-SORT ROUNDED = DUMMY ** 2 + SDSK-SORT.
           GO TO READ-PROF-FILE.
       RESULT-CALCULATIONS.
           DIVIDE NK-SORT INTO ZK-SORT GIVING SK-SORT ROUNDED.
           MOVE X (4) TO X1K-SORT.
           MOVE X (3) TO X2K-SORT.
           MOVE X (2) TO X3K-SORT.
           COMPUTE SDSK-SCRT ROUNDED = (14 * ESK-SORT - 36 * SDSK-SORT)
           / (NK-SORT ** 2).
           COMPUTE SDSK-SORT ROUNDED = SDSK-SORT ** .5.
           MULTIPLY 6.0 BY ESK-SORT ROUNDED.
           DIVIDE NK-SCRT INTO ESK-SCRT ROUNDED.
       RELEASE-TO-SORT.
           MOVE IDENT TO PROF-SORT.
           MOVE VOTER TO VOTER-SORT.
           ADD 1, NK-SORT GIVING DOPEY.
           ADD 1 TO POINTS (DOPEY).
           RELEASE SORT-RECORD.
           ADD 1 TO INDEX.
       ZERO-RESULTS.
           MOVE ZEROES TO SORT-RECORD.
           MOVE ZEROES TO VARIABLES.
           MOVE NUMBER TO IDENT.
           GO TO INTERMEDIATE-CALCULATIONS.
       GRAPH-ROUTINE.
           MOVE SPACES TO GRAPH-RECORD.
           ADD 1 TO K.
           IF K IS NOT EQUAL TO 10 THEN GO TO GRAPH-CONT.
           MOVE ZERO TO K.
```

```
    IF J IS EQUAL TO 9 THEN GO TO GRAPH-CONT.
    ADD 1 TO J.
    MOVE J TO GRAPH (8).
    MOVE '0' TO GRAPH (9).
GRAPH-CONT.
    MOVE '0' TO GRAPH (10).
    ADD 10, POINTS (I) GIVING SCRIPT.
    MOVE '*' TO GRAPH (SCRIPT).
    WRITE GRAPH-RECORD AFTER ADVANCING 1 LINES.
COMPLETION.
    DISPLAY 'NUMBER OF RECORDS ON PROF-FILE          ' CNTR.
    DISPLAY 'NUMBER OF RECORDS RELEASED TO SORT      ' INDEX.
    PERFORM GRAPH-ROUTINE THRU GRAPH-CONT VARYING I FROM 2
    BY 1 UNTIL I IS EQUAL TO 500.
    CLOSE GRAPH-FILE, PROF-FILE.
FINISH SECTION.
    MOVE ZERO TO INDEX.
    MOVE ZERO TO CNTR.
    MOVE ZERO TO DOPEY.
    MOVE HEADING-FORMAT TO HEADER-FIELDS.
    WRITE HEADING-RECORD AFTER ADVANCING 0 LINES.
RETURN-SORT-FILE.
    IF CNTR IS EQUAL TO 75 THEN PERFORM HEADER-ROUTINE.
    IF CNTR IS EQUAL TO 150 THEN PERFORM HEADER-ROUTINE.
    IF CNTR IS EQUAL TO 225 THEN PERFORM HEADER-ROUTINE.
    RETURN SORT-FILE AT END GO TO WRAPUP.
    ADD 1 TO INDEX.
    MOVE SPACES TO SCOR-RECORD.
    MOVE PROF-SORT TO PROF IN SCOR-RECORD.
    MOVE SK-SORT TO SK.
    MOVE NK-SORT TO NK.
    MOVE ZK-SORT TO ZK.
    MOVE DK-SORT TO DK.
    MOVE X1K-SORT TO X1K.
    MOVE X2K-SORT TO X2K.
    MOVE X3K-SORT TO X3K.
    MOVE ESK-SORT TO ESK.
    MOVE SDSK-SORT TO SDSK.
    SUBTRACT X1K-SORT, X2K-SORT, X3K-SORT FROM NK-SORT GIVING
    DIFF.
    IF SDSK-SORT IS EQUAL TO 0 THEN ADD 1 TO DOPEY, GO TO
    WRITE-RECORD.
    COMPUTE QUO ROUNDED = (SK-SORT - ESK-SORT) / SDSK-SORT.
WRITE-RECORD.
    ADD NK-SORT TO N-MEAN.
    COMPUTE N-VAR ROUNDED = NK-SORT * NK-SORT + N-VAR.
    WRITE SCOR-RECORD AFTER ADVANCING 1 LINES.
    ADD 1 TO CNTR.
```

```
            GO TO RETURN-SORT-FILE.
        HEADER-ROUTINE.
            MOVE SPACES TO HEADER-FIELDS.
            MOVE HEADING-FORMAT TO HEADER-FIELDS.
            WRITE HEADING-RECORD AFTER ADVANCING 0 LINES.
        WRAPUP.
            DISPLAY 'NUMBER OF RECORDS RETURNED FROM SORT    ' INDEX.
            DISPLAY 'NUMBER OF RECORDS PRINTED               ' CNTR.
            DISPLAY '                    '.
            DISPLAY '                    '.
            DISPLAY '                    '.
            SUBTRACT DOPEY FROM CNTR.
            DIVIDE CNTR INTO N-MEAN GIVING DODO ROUNDED.
            DIVIDE CNTR INTO N-VAR GIVING DUMDUM ROUNDED.
            COMPUTE DUMDUM ROUNDED = DUMDUM - DODO * DODO.
            MOVE DUMDUM TO VAR.
            MOVE DODO TO MEAN.
            DISPLAY 'N-MEAN          ' MEAN.
            DISPLAY 'N-VAR           ' VAR.
            COMPUTE VAR ROUNDED = DUMDUM ** 0.5.
            DISPLAY 'SDN             ' VAR.
            CLOSE SCOR-FILE.
//GO.SORTPR DD SYSOUT=A
//GO.SORTLIB DD DSNAME=SYS1.SORTLIB,DISP=OLD
//GO.SORTWK01  DD  UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK02  DD  UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK03  DD  UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK04  DD  UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK05  DD  UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.SORTWK06  DD  UNIT=SYSDA,SPACE=(TRK,(20),,CONTIG)
//GO.PROF    DD DSNAME=PRO,UNIT=2400,VOL=SER=NPS115,LABEL=(,SL),        *
//     DISP=(OLD,KEEP),DCB=(RECFM=FB,LRECL=22,BLKSIZE=1100)
//GO.SCORE     DD    SYSOUT=A,DCB=(RECFM=FB,LRECL=133,BLKSIZE=3325)
//GO.GRAPH  DD  SYSOUT=A,DCB=(RECFM=FB,LRECL=133,BLKSIZE=3325)
```

PROGRAM 4 DOMINANCE

```
// EXEC WATFORG
//SYSIN DD *
$JOB  JOB (1949.1610WT.CS12).'SCANGO
C     THIS PROGRAM MAKES BOTH AN ABSOLUTE AND COMPLETE DOMINANCE TEST
C     FOR EACH OF THE PROFESSORS READ. THE PRINTOUT SHOWS A ZERO UNDER
C     THE AD COLUMN IF THE PROFESSOR IS NOT ABSOLUTELY DOMINATED. OTHER-
C     WISE A ONE IS PLACED UNDER THE AD COLUMN. THE COMPLETE DOMINANCE
C     COLUMN HAS THE SAME NOTATION FOR COMPLETE DOMINANCE RESULTS FOR
C     EACH PROFESSOR.
      DIMENSION PROF(50),V1K(50),V2K(50),V3K(50)
      INTEGER PROF
      WRITE (6,7)
    7 FORMAT ('1',11X,'PROF',7X,'V1K',7X,'V2K',7X,'V3K',5X,
     *4X,'AD',8X,'CD'///)
C
C   READ NO OF PROFS TO BE READ
C
      READ (5,3) NOPROF
    3 FORMAT (I5)
      IF (NOPROF.GT.50) GO TO 10
C
C   READ INFORMATION FOR EACH PROF
C
      DO 1 I=1,NOPROF
    1 READ (5,2) PROF(I),V1K(I),V2K(I),V3K(I)
    2 FORMAT (I10,3F10.2)
      DO 9 I = 1,NOPROF
      ICDOM = 1
      IADOM = 1
C
C   TESTS FOR COMPLETE DOMINANCE
C
      DO 5 J = 1,NOPROF
      IF (I.EQ.J) GO TO 5
      Y = (V2K(J)-V2K(I) + V1K(J) -V1K(I))/(V3K(I)-V3K(J))
      IF (V3K(I).EQ.V3K(J)) GO TO 11
      IF ((V3K(I).LT.V3K(J).AND.V1K(I).LT.V1K(J).AND.Y.LT.0.0).OR.
     *(V3K(I).GT.V3K(J).AND.V1K(I).LT.V1K(J).AND.Y.GT.1.0)) GO TO 4
      GO TO 5
   11 Y = (V2K(J)-V2K(I))/(V1K(I)-V1K(J))
      IF(V1K(J).LT.V1K(I).AND.Y.LT.1.0) GO TO 4
      IF(V1K(J).EQ.V1K(I).AND.V2K(J).GT.V2K(I)) GO TO 4
    5 CONTINUE
      ICDOM = 0
C
```

```
C
    4 WRITE(6,537) I,J,Y
  537 FORMAT(9X,I5,5X,I5,F10.6)
C
C    TESTS FOR ABSOLUTE DOMINANCE
C
      DO 8 J=1,NOPROF
      IF (I.EQ.J) GO TO 8
      IF (V1K(J).GT.V1K(I).AND.V2K(J).GT.V2K(I).AND.
     *V3K(J).GT.V3K(I)) GO TO 9
    8 CONTINUE
      IADOM=0
    9 WRITE (6,6) PROF(I), V1K(I), V2K(I),V3K(I),IADOM,ICDOM
    6 FORMAT (5X,I10,2X,3F10.3,2I10)
   10 STOP
      END
$GO
```

PROGRAM 5 PAIRED COMPARISONS

```
//  EXEC  FORTCLG,PARM.FORT='LIST,SOURCE,NODECK,MAP',
//    REGION.GO=175K,TIME.GO=2
//FORT.SYSIN DD *
C   THIS PROGRAM COMPARES THE SCORES OF THE ITH PROFESSOR AGAINST
C   THAT OF THE JTH PROFESSOR WITH THE CONSTRAINT THAT EACH OF
C   THESE PROFESSORS IS KNOWN BY A GIVEN VOTER.
C
C
      DIMENSION NK(20),ALPHA(20,20),BETA(20,20),SCORE(20,20),FILLER(4)
      DIMENSION FRACT(20,20,3),XIK(20,20,3)
      INTEGER BALLOT (20,140),VOTE(20,140),PROF(20),B,P,V
      INTEGER ROF(5)
      INTEGER ONE,TWO,THREE
C
C   N IS THE NUMBER OF PROFESSORS TO BE COMPARED.
C   NN IS THE MAXIMUM VALUE OF NK AMONG THE N PROFESSORS.
C   NNN IS THE NUMBER OF PLACE VOTES.
C
      READ (5,1) N,NN,NNN
    1 FORMAT (3I5)
      WRITE (6,61) N,NN,NNN
   61 FORMAT (10X,3I5)
C
C   READ WEIGHTS FOR VOTES.
C
      READ (5,51) ONE,TWO,THREE
   51 FORMAT (3I5)
      WRITE (6,51) ONE,TWO,THREE
C
C   READ PROFESSOR NUMBER IN ASCENDING ORDER.
C
      READ (5,101) (ROF(I),I=1,N)
  101 FORMAT (I5)
      WRITE (6,101) (ROF(I),I=1,N)
C
C   READ NK AND PROFESSOR IN DESIRED ORDER OF OUTPUT (USUALLY ORDERED
C   BY DESCENDING SCORE).
C
      DO 2 I=1,N
      READ (5,3) NK(I),PROF(I)
    3 FORMAT (2I5)
    2 CONTINUE
      WRITE (6,41) (PROF(I), I=1,N)
C
C   ZERO MATRICES
```

```
C
      DO 13 I=1,N
      DO 13 J=1,N
      ALPHA(I,J)=0.0
      BETA(I,J)=0.0
      SCORE(I,J)=0.0
      DO 13 K=1,NNN
      XIK(I,J,K)=0.0
   13 FRACT(I,J,K)=0.0
      DO 15 I=1,N
      DO 15 J=1,NN
      BALLOT (I,J)=0
   15 VOTE (I,J)=0
      K=0
C
CC    READ PROF FILE AND SEARCH PROFESSOR NUMBER FIELD.
C
    4 K=K+1
    6 READ (8,5) B,P,V,FILLER(1),FILLER(2),FILLER(3),FILLER(4)
    5 FORMAT (I4,I3,I1,3A4,A2)
      IF (P.NE.ROF(K)) GO TO 6
      DO 100 I=1,N
      IF (ROF(K).NE.PROF(I)) GO TO 100
      BALLOT(I,1)=B
      VOTE (I,1)=V
      M=NK(I)
C
CC    READ REMAINING RECORDS FOR A GIVEN PROFESSOR.
C
      DO 7 J=2,M
      READ (8,5) BALLOT(I,J),PROF(I),VOTE(I,J),
     1FILLER(1),FILLER(2),FILLER(3),FILLER(4)
    7 CONTINUE
  100 CONTINUE
      IF (K.NE.N) GO TO 4
C
CC    APPLY WEIGHT FACTORS TO EACH VOTE.
C
      DO 52 I=1,N
      DO 52 J=1,NN
      IF (VOTE(I,J).EQ.1) GO TO 53
      IF (VOTE(I,J).EQ.2) GO TO 54
      IF (VOTE(I,J).EQ.3) GO TO 55
      GO TO 52
   53 VOTE(I,J)=THREE
      GO TO 52
   54 VOTE(I,J)=TWO
      GO TO 52
```

```
   55 VOTE(I,J)=ONE
   52 CONTINUE
      L=N-1
C
CC    COMPUTE COMPARISON NK, ZK, AND XIK FOR EACH PROFESSOR.
C
      DO 10 I=1,L
      K=I+1
      DO 10 II=K,N
      M=NK(I)
      MM=NK(II)
      DO 12 J=1,M
      DO 12 JJ=1,MM
      IF (BALLOT(I,J).NE.BALLOT(II,JJ)) GO TO 12
      WRITE (6,75) BALLOT(I,J)
   75 FORMAT (10X,I4)
      ALPHA(I,II)=ALPHA(I,II)+1
      ALPHA(II,I)=ALPHA(II,I)+1
      BETA(I,II)=VOTE(I,J)+BETA(I,II)
      BETA(II,I)=VOTE(II,JJ)+BETA(II,I)
      IF (VOTE(I,J).EQ.ONE) GO TO 62
      IF (VOTE(I,J).EQ.TWO) GO TO 63
      IF (VOTE(I,J).EQ.THREE) GO TO 64
      GO TO 65
   62 XIK(I,II,1)=XIK(I,II,1)+1
      GO TO 65
   63 XIK(I,II,2)=XIK(I,II,2)+1
      GO TO 65
   64 XIK(I,II,3)=XIK(I,II,3)+1
   65 IF (VOTE(II,JJ).EQ.ONE) GO TO 66
      IF (VOTE(II,JJ).EQ.TWO) GO TO 67
      IF (VOTE(II,JJ).EQ.THREE) GO TO 68
      GO TO 69
   66 XIK(II,I,1)=XIK(II,I,1)+1
      GO TO 69
   67 XIK(II,I,2)=XIK(II,I,2)+1
      GO TO 69
   68 XIK(II,I,3)=XIK(II,I,3)+1
   69 CONTINUE
   12 CONTINUE
   10 CONTINUE
C
CC    COMPUTE COMPARISON FRACTIONS OF PLACE VOTES.
C
      DO 70 I=1,N
      DO 70 II=1,N
      IF (ALPHA(I,II).EQ.0.0) GO TO 70
      DO 74 K=1,NAN
```

```
   74 FRACT(I,II,K)=XIK(I,II,K)/ALPHA(I,II)
   70 CONTINUE
C
CC    COMPUTE COMPARISON SCORE.
C
      DO 20 I=1,N
      DO 20 II=1,N
      IF (ALPHA(I,II).EQ.0.0) GO TO 20
      SCORE (I,II)=BETA(I,II)/ALPHA(I,II)
   20 CCNTINUE
C
CC    WRITE RESULTS.
C
      DO 50 I=1,N
      WRITE (6,30)
   30 FORMAT ('1',50X,'PAIRED COMPARISONS OF FACULTY MEMBERS')
      WRITE (6,40)
   40 FORMAT (////10X,'PROF',6X,'NK',8X,'BALLOT',4X,'VOTE',4X)
      WRITE (6,41) NK(I)
   41 FORMAT (/20X,I3)
      M=NK(I)
      DO 50 J=1,M
      WRITE (6,42) BALLOT(I,J),VOTE(I,J)
   42 FORMAT (30X,I4,6X,I1)
   50 CONTINUE
      WRITE (6,34)
   34 FORMAT ('1',57X,'N MATRIX'//)
      WRITE (6,35) ((ALPHA(I,II),II=1,N),I=1,N)
   35 FORMAT (/20(2X,F4.0))
      WRITE (6,36)
   36 FORMAT ('1',57X,'Z MATRIX'//)
      WRITE (6,35) ((BETA(I,II),II=1,N),I=1,N)
      WRITE (6,37)
   37 FORMAT ('1',55X,'SCORE MATRIX'//)
      WRITE (6,38) ((SCORE(I,II),II=1,N),I=1,N)
   38 FORMAT (/20(2X,F4.2))
      WRITE (6,71)
   71 FORMAT ('1',53X,'FRACTION MATRIX'//)
      DO 73 I=1,N
      DO 73 II=1,N
      WRITE (6,72) I,II,(FRACT(I,II,K),K=1,NNN)
   72 FORMAT (//10X,I2,'VS.',I2/10X,3(F10.5,5X))
   73 CONTINUE
      STOP
      END
//GO.SYSUDUMP DD SYSOUT=A
//GO.FT08F001   DD  DSNAME=PRO,UNIT=2400,VOL=SER=NPS115,LABEL=(,NL),   *
//    DISP=(OLD,KEEP),DCB=(RECFM=FB,LRECL=22,BLKSIZE=1100)
```

```
//GO.SYSIN DD *
```

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Patsy Donald Scango

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13. ABSTRACT

The purpose of this thesis was to apply computer compatible decision techniques to the problem of selecting a recipient for the Rear Admiral John J. Shieffelin Award for Excellence in Teaching at the Naval Postgraduate School

These computerized techniques were used to analyze the data from the ballots. The balloting process is described and computer programs are presented. Special studies were made using Kendell's coefficient of concordance. Their purpose was to investigate the issue of whether students and alumni rank faculty members in the same way. In addition the ranking of faculty members across years was studied. The results of this part of the study was that, on a statistical basis, it can be stated that the student and alumni ratings of faculty rankings have been stable over the three years the award has been presented.

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The third annual award for excellence in teaching an analysis of procedure and data.