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Appendix 11.1 FORTRAN LISTING OF PROGRAM ELFO

General Notes

1. Data are read from a file in statement lines 1040-1140 in much the same form as in program *ELFO* except that the shear modulus and shape factor are omitted, as shear strains are not considered in this version.
2. The degree of freedom is computed (1150-1180), the initial joint coordinates are duplicated (1190-1210), and one load set only is input and the load vector *VL* assembled in statement lines 1220-1380.
3. The cycle counter and deflection vector are set to zero and the cycle limit (15) set in statement lines 1390-1420. The Euler loads are computed and the nonzero components of the member-stiffness matrix evaluated in lines 1430-1560.
4. The statics matrix is generated by statement lines 1570-1990 and the frame-stiffness matrix *ASAT* formed by statement lines 2000-2130. The array *ASAT* is augmented by the load vector, the stiffness equations solved for displacements (2120-2380), and the stress-resultant vector *SATX* produced by statement lines 2390-2480.
5. Computed deflections are compared with previous values to 0.5 per cent (*ZZ*) to detect convergence, and, if this has not occurred, the nonzero components of the member-stiffness matrix are altered (2570-2960), the new deflections are recorded (2970-2980), and the joint coordinates are adjusted in statement lines 2990-3060.
6. The remainder of the program is concerned with the printing of the first-order solution and of the second-order results if convergence has occurred within the set cycle limit. Otherwise, the results of the last cycle of analysis are output.

PROGRAM ELFO

```

1000 DIMENSION A(18,24),ASAT(18,19),CORD(9,2),JTYPE(9,3),
1010 + MCON(8,2),SMA(8),AREA(8),EULER(8),OLEN(8),E(8),VL(18)
1020 + SF(16,2),SA(8),CSAT(24),SATX(24),DEFX(18),SCOR(9,2)

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Appendix

Appendix 11.1 FORTRAN LISTING

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1030 $FILE ELSODA
1040 10 READ(1),JFN
1050 IF(JFN)20,20,30
1060 20 STOP
1070 30 READ(1),JCT,NM
1080 PRINT 40,JFN
1090 40 FORMAT(///43H EL
1100 + FRAME NO.,I4//)
1110 DO 50 I=1,JCT
1120 50 READ(1),(CORD(I,J),
1130 DO 60 I=1,NM
1140 60 READ(1),(MCON(I,J),
1150 L=0
1160 DO 70 I=1,JCT
1170 DO 70 J=1,3
1180 70 L=L+JTYPE(I,J)
1190 DO 61 I=1,JCT
1200 DO 61 J=1,2
1210 61 SCOR(I,J)=CORD(I,J)
1220 71 READ(1),LSN,LN
1230 IF(LSN)10,10,78
1240 78 DO 72 I=1,L
1250 72 VL(I)=0.
1260 DO 77 I=1,LN
1270 READ(1),JN,(OLEN(J),J=1
1280 LL=0
1290 LJ=JN-1
1300 IF(LJ)75,75,73
1310 73 DO 74 J=1,LJ
1320 DO 74 K=1,3
1330 74 LL=LL+JTYPE(J,K)
1340 75 DO 77 K=1,3
1350 IF(JTYPE(JN,K))77,77,76
1360 76 LL=LL+1
1370 VL(LL)=OLEN(K)
1380 77 CONTINUE
1390 NCYCL=0
1400 LIM=15
1410 DO 90 I=1,L
1420 90 DEFX(I)=0.
1430 DO 270 I=1,NM
1440 J1=MCON(I,1)
1450 J2=MCON(I,2)
1460 X=CORD(J1,1)-CORD(J2,1)
1470 Y=CORD(J1,2)-CORD(J2,2)
1480 OLEN(I)=SQRT(X*X+Y*Y)
1490 PI=3.14159265
1500 270 EULER(I)=PI*PI*E(I)*SMA
1510 DO 280 I=1,NM

```