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//BURN EXEC FORTGCLG
//FORT.SYSIN DD *
C   THIS IS A ONE-DIMENSIONAL Q-CODE ADAPTED FROM ONE WRITTEN BY
C   JOHN O. ERKMAN OF SRI, WHO MODELED AFTER ONE WRITTEN BY
C   MARK WILKINS OF LRL. AN APPROXIMATE DESCRIPTION CAN BE FOUND
C   IN "COMPUTATIONAL PHYSICS. VOL. III," EDITED BY ALDER AND
C   FERNBACH AND ROTENBERG
C   THE PROBLEM IS SET UP IN SUBROUTINE "DECIDE."
C   THE MEANING OF KEY SYMBOLS IS DESCRIBED THERE.
COMMON /C1ZON/ H(9),BURN(9),L(9),DX(9),S1,RHO(9)
COMMON /C2TIME/ TIMES,CYCLE,DELT,DTN,DTMX,TLIMA(300),JCRIT,
1  TQUIT,TAU
COMMON /C3CTRL/ COUNTS,JSTAR,JPE,JPB,JQUIT,LAST,CYCLES
COMMON /C4FLOW/ U(300),V(300),X(300),Q(300),P(300),E(300),QA,VN,
1  MASS(300),CSP(300)
COMMON /C7GNRL/ ALP,OPTION,CONA,CQ,LEFTP
C
C   INTEGER  H,BURN,S,S1,ZON,CYCLE,COUNTS,CYCLES,ALP,OPTION,H2,HS1,HS,
C
1  BURNS,HS2
REAL  L,MASS,LINEAR,LEFTP
C
CALL DECIDE
C   THE FOLLOWING DO LOOPS ENDING AT STATEMENT 9 CALCULATE THE
C   POSITION OF THE J'TH CELL IN CM AND ITS MASS IN GRAMS.  RHO(S)=
C   DENSITY OF REGION S IN GRAMS/CC.
DO 9 S=2,S1
HS1=H(S-1)+1
HS2=H(S)
DO 9 J=HS1,HS2
X(J+1)=X(J)+DX(S)
9  MASS(J)=(X(J+1)**ALP-X(J)**ALP)*RHO(S)
C
C   THE VARIABLES IN THE FOLLOWING FOUR WRITE STATEMENTS HAVE BEEN
C   DEFINED IN SUBROUTINE DECIDE.
WRITE(6,951)ALP,DELT,DTMX,CONA,CQ
WRITE(6,952)CYCLES,COUNTS,JQUIT
952  FORMAT('0','CYCLES',6X,'COUNTS',6X,'JQUIT'/I6,4X,I6,6X,I6)
WRITE(6,957)S1,(BURN(S),S=2,S1)
WRITE(6,961)TAU,LEFTP,U(1),OPTION
C
C   IF (OPTION.EQ.6) CALL FLIER
C   IF (OPTION.NE.6) JSTAR=5
C
CALL WRITE1
C
CQSQ=CQ**2
CQSQ4=4.0*CQSQ
LINEAR=1.0+CONA+CONA
C   "TIMES"=T, THE TIME VARIABLE, MEASURED FROM ZERO.
TIMES=0.0
CYCLE=0
C   "JCRIT"=NO. OF SPACE CELL FOR WHICH TLIMA(J) HAD ITS MINIMUM
C   VALUE IN THE PREVIOUS CYCLE.
JCRIT=0

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C      "LAST" IS AN INTEGER CONTROL PARAMETER WHICH DIRECTS THE
C      SUBROUTINE "WRITE" TO PERFORM A TERMINAL COMPUTATION AFTER THE
C      INTEGRATION HAS BEEN COMPLETED.
      LAST=0
C      "DTN" IS THE VALUE OF "DELT" CALCULATED IN THE CYCLE BEFORE LAST.
      DTN=DELT
      DELTI=DELT+DELT
C-----START OF TIME LOOP
C      PPEAK=MAXIMUM VALUE OF PRESSURE CALCULATED IN PREVIOUS CYCLE.
      40 PPEAK=0.0
C      TLIMB=TLIMA(JCRIT)=MINIMUM VALUE OF TLIMA(J).
      TLIMB=1.0
      TIMES=TIMES+DELT
      CYCLE=CYCLE+1
      50 J=1
          S=2
          J1=2
          JT=3
          PLEFT=0.0
C      COMMENT EVALUATE P FOR FIRST CELL AND U AND X ON LEFT BOUNDARY
      GO TO (51,52,53,54,60,60),OPTION
      51 IF(TIMES .LE. TAU) PLEFT=LEFTP
          GO TO 60
      52 IF(TIMES .LE. TAU) PLEFT=((-TIMES/TAU)+1.0)*LEFTP
          GO TO 60
      53 PLEFT=LEFTP*EXP(-0.46*TIMES)
      54 CONTINUE
      60 IF(ALP.EQ.1)U(1)=-((P(1)+Q(1)-PLEFT)/(X(2)-X(1)))*V(1)*DELT+U(1)
          XA=U(1)*DELT+X(1)
C-----START OF J-LOOP
      70 IF(J.GT.H(S)) S=S+1
      78 DENU=(X(JT)-X(J1))/V(J1)+(X(J1)-X(J))/V(J)
      79 U(J1)=(DELT*(P(J)-P(J1)+Q(J)-Q(J1)))/DENU+U(J1)
      80 X(J)=XA
          XA=DELT*U(J1)+X(J1)
          IF(J .EQ. H(S1)) X(J1)=XA
          IF(ABS(U(J1)) .LT. 5.0E-5) U(J1)=0.0
          VN=(XA**ALP-X(J)**ALP)/MASS(J)
          DELU=U(J1)-U(J)
          DELX=XA-X(J)
C
C-----GET Q FOR SHOCK
C      "QA"=NEW VALUE OF ARTIFICIAL VISCOUS STRESS; Q(J) IS "OLD" VALUE.
      87 QA=-DELU*(CQSQ*ABS(DELU)+CONA*CSP(J))/VN
          IF(QA .LT. 0.0) QA=0.0
C      "TLIMA(J)=TIME PARAMETER USED IN CALCULATING THE VALUE OF DELT
C      FOR THE NEXT TIME STEP. AT THIS POINT VN, THE NEW VALUE OF
C      SPECIFIC VOLUME, AND QA ARE AVAILABLE, SO THE INFORMATION REQUIRED
C      FOR CALCULATING PRESSURE IN CELL J,P(J),ENERGY,F(J), ETC. IS AT
C      HAND. THESE CALCULATIONS ARE MADE IN SUBROUTINES B_EQST(S,J),
C      WHICH ARE ENTRY POINTS IN B_INIT(S). CONTROL IS TRANSFERRED TO
C      SUBROUTINE EQST(S,J), AND FROM THIS IT IS TRANSFERRED TO THE
C      APPROPRIATE B_EQST(S,J).
      TLIMA(J)=DELX/(LINEAR*CSP(J)+CQSQ4*ABS(DELU))
      CALL EQST(S,J)

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