BENCHMARK PROBLEM

Identification

16-A1

Source Situation: ID.16

Date Submitted:

July 1980

H. L. Dodds, Jr. By:

(Univ. of Tennessee)

Date Accepted:

October 1985

R. M. Westfall (ORNI)
C. E. Lee (Consult.)

Descriptive Title:

Delayed Supercritical Transient; One-Dimensional, Two-Group Neutron Transport Problem in a Fast Reactor

Reduction of Source Situation:

- One-dimensional (slab with azimuthal symmetry), two-group neutron transport theory
- 2. Isotropic scattering
- 3. Zero return current boundary conditions on external surfaces
- 4. Steady-state critical initial conditions
- 5. Six delayed neutron precursor groups

The equations for this mathematical model are 1

(1)
$$\frac{1}{v_g} \frac{\partial}{\partial t} \phi_g(x,\mu,t) + \mu \frac{\partial}{\partial x} \phi_g(x,\mu,t) + \Sigma_t^g(x,t) \phi_g(x,\mu,t) =$$

$$\frac{1}{2} \sum_{g'=1}^{2} \left[\chi_g^p(1-\beta) v \Sigma_f^{g'}(x,t) + \Sigma_s^{g'} \phi_g(x,t) \right] \phi_{g'}(x,t)$$

$$+ \frac{1}{2} \sum_{i=1}^{6} \lambda_i C_i(x,t) \chi_g^i + Q_g(x,\mu,t) : g = 1,2$$

(2)
$$\frac{\partial}{\partial t} C_{i}(x,t) + \lambda_{i} C_{i}(x,t) = \beta_{i} \sum_{g=1}^{2} v \Sigma_{f}^{g} \phi_{g}(x,t); i = 1, ..., 6$$

where $\phi_{\alpha}(x,t)$ = scalar group flux (neutrons/cm²-sec)

$$\phi_{g}(x,t) = \int_{1}^{+1} \phi_{g}(x,\mu,t) d\mu$$

 $\phi_q(x,\mu,t)$ = angular group flux (neutrons/cm²-sec-unit cosine)

$$\phi_g(x,\mu,t) = \int_0^{2\pi} \phi_g(x,\mu,\varphi,t) d\varphi, \varphi = \text{azimuthal angle}$$

 $C_i(x,t)$ = concentration of type i precursor (nuclei/cm³) and the remaining terms are defined in detail in References 1, 2, or 3. For the problem, $\chi_\alpha^p = \chi_\alpha^i = \chi_\alpha$ and $Q_1 = Q_2 = 0$.

Date: Initial two-group constants shown in Table I. Delayed neutron parameters, fission spectra, and l/v values shown in Table II.

The initial configuration is made critical by dividing the production cross sections by k-eff, and the initial precursor concentrations are in equilibrium with the initial critical flux distribution.

Initial Perturbation:

At time t = 0.0 sec, the density of the material in Zone 2 is increased by 5% and the density of the material in Zone 6 is decreased by 5% (resulting in a step insertion of reactivity at time t = 0.0 sec).

Expected Primary Results:

- 1. Initial k-eff and initial scalar flux distribution for each group
- Convergence requirements on flux (and eigenvalue) if an iterative solution is used
- 3. Total reactor power versus time (normalized such that the total neutron production rate at t = 0.0 is 1.0 neutron/sec)
- 4. Time-dependent group flux (i.e., scalar flux) distributions
- 5. Sensitivity of results to time step size
- 6. CPU time and core storage requirements

Table I.	Initial	Two-Group	Constants ^a	(cm^{-1})
10010 11	2	1110 0.00	00110001100	\ \ \ /

Zone	Group g	vΣ ^g	Σg t	Σ ^{g→g} S	Σ ^{g→g} ´ s
1,7 ^b	1	8.3441-4	2.411-1	2.33644-1	3.598-3
	2	3.2776-4	4.172-1	4.07004-1	0.0
2,4,6 ^c	1	7.4518-3	1.849-1	1.77711-1	2.085-3
	2	1.10612-2	3.668-1	3.53721-1	0.0
$3,5^{d}$	1	0.0	9.432-2	8.571-2	1.7168-3
	2	0.0	1.8762-1	1.7131-1	0.0

 $^{{}^{}a}\Sigma_{a}^{g} = \Sigma_{t}^{g} - \Sigma_{s}^{g}$ and $\Sigma_{s}^{g} = \Sigma_{s}^{g} + \Sigma_{s}^{g \to g}$.

Table II. Delayed Neutron Parameters^a

Туре	βi	λ (sec ⁻¹)
1	0.81-4	0.0129
2	6.87-4	0.0311
3	6.12-4	0.134
4	11.38-4	0.331
5	5.12-4	1.26
6	1.70-4	3.21

^aPrompt and delayed neutron spectra are identical with χ_1 = 1.0 and χ_2 = 0.0, Also, $1/v_1$ = 1.851-9 $\frac{\text{sec}}{\text{cm}}$ and $1/v_2$ = 1.088-8 $\frac{\text{sec}}{\text{cm}}$.

^bBlanket material in Zones 1 and 7.

 $^{^{}c}$ Core material in Zones 2, 4, and 6.

 $[^]d$ Mixture of sodium and control rod material in Zones 3 and 5.

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Possible Additional Results:

- 7. Zone-averaged power fractions versus time
- 8. Sensitivity of results to spatial mesh size
- Sensitivity of results to angular quadrature (if solution is obtained by the discrete ordinates method)

Based on preliminary static k-eff calculations of the initial critical configuration using ANISN, an S_4 quadrature with 114 spatial intervals (as defined in Tables III and IV) is a sufficiently accurate representation for the angular and spatial discretization. Specifically, by using a finer spatial mesh (i.e., 228 intervals), k-eff changed by 0.0001 and using an S_8 and S_{16} quadrature, k-eff changed by 0.0003 and 0.0003 respectively. Therefore, it is suggested that the "Expected Primary Results" requested above be obtained initially using the discretization indicated in Tables III and IV if the conventional discrete ordinates method is used to obtain solutions. Also, if a discrete ordinates method is used, it may be worthwhile to note that the units for angular flux in most discrete ordinates codes are per "unit weight" rather than per "unit cosine," as indicated earlier in the definitions following Eq. (2).

Table III. S₄ Angular Quadrature

-4
Weight
0.0
0.25
0.25
0.25
0.25

Table IV. Spatial Mesh

Zone	Number of Equal Intervals
1	20
2	24
3	5
4	16
5	5
6	24
7	20

REFERENCES

- 1. G. I. Bell and S. Glasstone, <u>Nuclear Reactor Theory</u>, Van Nostrand Reinhold Co., p. 466 (1970).
- 2. H. L. Dodds, Jr. et al., Nucl. Sci. Eng., 47, p. 264 (1972).
- 3. T. R. Hill and W. H. Reed, "TIMEX: A Time-Dependent Explicit Discrete Ordinates Program for the Solution of Multigroup Transport Equations with Delayed Neutrons," LA-6201-MS, Los Alamos Scientific Laboratory (1976).
- 4. W. W. Engle, Jr., "A User's Manual for ANISN, A One-Dimensional Discrete Ordinates Transport Code with Anisotropic Scattering," ORGDP-K-1693, Oak Ridge Gaseous Diffusion Plant (1967).

BENCHMARK PROBLEM

Identification: 16-A1 Source Situation: ID.16

Date Submitted: July 1980 By: H. L. Dodds, Jr.

(Univ. of Tennessee)

Date Accepted: October 1985 By: R. M. Westfall

Oak Ridge National Laboratory

C. E. Lee (Consult.)

Acceptance is based upon agreement between independent solutions obtained with the TIMEX and TDA computer programs (solutions 16-A1.1 and 16-A1.2). In comparing the solutions it should be borne in mind that the power is normalized to one neutron per second at time equals zero. Also it should be noted that the tabulated values of the scaler flux are mesh-interval-average values for TDA and mesh-interval-boundary values for TIMEX. With regard to the power, solutions by TIMEX and TDA disagree by 2% or less for $0 \le t \le 10^{-1}$ seconds and for $t \ge 10^{-1}$ seconds, the disagreement varies from 2 to 4%. Therefore, the reviewers find the two solutions acceptable as computational benchmark solutions for the time interval $0 \le t \le 10^{-1}$ seconds.

BENCHMARK PROBLEM SOLUTION

Identification: 16-A1-1 Benchmark Problem ID.16-A1

Date Submitted: November 1981 By: T. R. Hill (Los Alamos National

Laboratory)

By: R. M. Westfall (ORNL)
C. E. Lee (Consult.)

Date Accepted: October 1985

Descriptive Title: Multigroup Discrete Ordinates Solution with TIMEX

Mathematical Model: Multigroup energy approximation, discrete ordinates angular approximation, linear discontinuous spatial approximation, first- order semi-implicit time difference scheme with fine- mesh rebalance and exponential extraplotation.

Pertinent Features of Techniques Used: S₄ angular quadrature, suggested 114 spatial intervals, 6 delayed neutron groups, exponential extrapolation of the time variable, with the following times steps used in each time zone:

Time Zone (sec)	Δt (sec)
0 to 10 ⁻³	2 x 10 ⁻⁸
10 ⁻³ to 10 ⁻¹	2×10^{-6}
10 ⁻¹ to 1.0	2×10^{-5}
1.0 to 10.0	2×10^{-4}

Computer: CDC 7600

Codes: ONETRAN, TIMEX (single precision, 14 decimal digits accuracy)

Date Solved: June 1981 at Los Alamos National Laboratory

References

- T. R. Hill and Wm. H. Reed, "TIMEX: A Time- Dependent Explicit Discrete Ordinates Program for the Solution of the Multigroup Transport Equations with Delayed Neutrons," Los Alamos Scientific Laboratory report LA-6201-MS (February 1976)
- 2. T. R. Hill, "ONETRAN: A Discrete Ordinates Finite Element Code for the Solution of the One- Dimensional Multigroup Transport Equation," Los Alamos Scientific Laboratory report LA-5990-MS (June 1975)

Primary Results:

Calculated $k_{\mbox{eff}}$ by ONETRAN for initial two group constants of Table I : 1.000198

Table I $\nu\Sigma_{\mathbf{f}}^{\mathbf{g}}$ were divided by this $\mathbf{k}_{\mathbf{eff}}$ for all TIMEX calculations. TIMEX uses a fixed time step in each time zone and requires no inner or outer iterations. CPU time is approximately 0.040 seconds per time step.

Exhibit A: Total power vs. time (relative to an initial total neutron production rate of 1.0) for the reference time step (dt) and for two and ten times the reference time step. Estimated accuracy of the time discretization: less than 0.01% at t= 10.0 seconds.

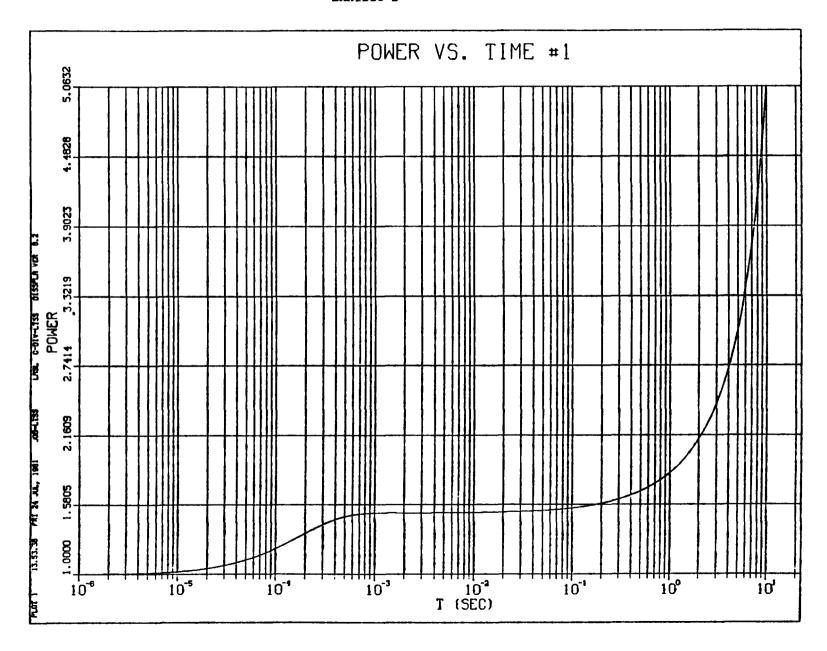
Exhibit B: Plot of total power vs. time for the reference time step size.

Exhibit C: Scalar flux vs. spatial position at t= 0.0, 0.01, and 1.0 seconds. TIMEX uses a linear discontinuous representation for the spatial distribution of the flux in each mesh interval. For each of the 114 spatial intervals, the scalar flux on the left and right boundaries, respectfully, of each mesh cell is given.

Exhibit D: Plot of data in Exhibit C.

EXHIBIT A POWER VS. TIME PROBLEM 16-A1 TIME

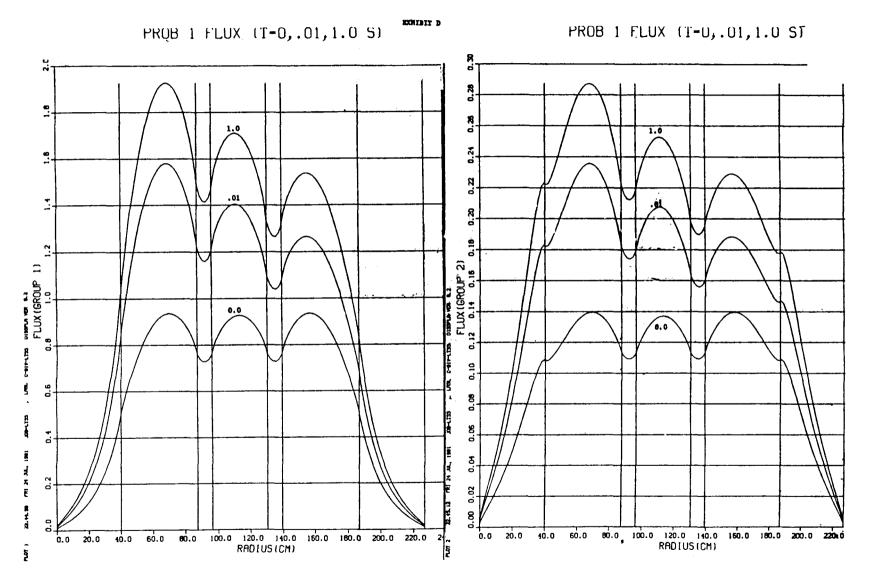
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23456789	7.2577E-03 1.1204E-02 1.5243E-02 1.9430E-02 2.3817E-02 2.8450E-02 3.3370E-02 3.8613E-02	PROBLEM 1 742825E-03 1-1202E-02 1-5240E-02 1-9428E-02 2-3815E-02 2-8448E-02 3-3612E-02 4-4204E-02	6. \$CAL 30 31. 32. 33. 34. 35. 36. 37.	AR FLUX (680 1.3154E-01 1.3400E-01 1.3405E-01 1.3767E-01 1.3801E-01 1.395E-01 1.391E-01 1.391E-01	UF-27F.T# ## 19408±6; 143003±601 143767±501 143801±501 14391±601 14391±601 14381±601 14381±601 14381±601	10 - 1.36736-61 51 - 1.35672-61 51 - 1.43991E-01 52 - 1.3144E-01 53 - 1.2827E-01 54 - 1.2439E-01	13391E-01 13144E-01 132627E-01 132627E-01 141977E-01 141977E-01 141049E-01 140935E-01	88 69 91 92 93 94 95	162371E-01- 182247E-01- 161917E-01- 161992E-01- 181290E-01- 181031E-01- 180840E-01- 180906E-01-	1 2 2 4 7 E - 0 1 1 3 1 9 1 6 E - 0 1 - 1 3 1 5 9 1 E - 0 1 1 3 1 2 8 8 E - 0 1 1 3 1 0 2 9 E - 0 1 1 4 0 0 7 8 9 E - 0 1
2345678	7.2577E-03 1.1204E-02 1.5243E-C2 1.9430E-02 2.3817E-02 2.8450E-02 3.3370E-02	PROBLEM 1 742825E-03 141202E-02 145240E-02 145240E-02 243815E-02 248446E-02 34389E-02 34369E-02	6 SCAL 30 31 32 33 34 35 36	AR FLUX (680 1.3154E-01 1.3400E-01 1.3405E-01 1.3767E-01 1.3801E-01 1.395E-01 1.391E-01 1.391E-01	127 TE 61 123 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10 - 1 - 3 0 7 3 6 - 0 1 51 - 1 - 3 3 5 0 7 2 - 0 1 51 - 1 - 3 3 9 1 E - 0 1 52 - 1 - 3 1 4 4 5 - 0 1 53 - 1 - 2 8 2 7 E - 0 1 54 - 1 - 2 4 3 0 E - 0 1 55 - 1 - 1 0 1 4 8 - 0 1 55 - 1 - 1 1 1 4 8 - 0 1	183391E-01 183144E-01 182627E-01 182438E-01 141977E-01 141361E-01 14049E-01 140935E-01	88 69 91 92 93 94 95	162371E-01- 182247E-01- 161917E-01- 161592E-01- 161592E-01- 161031E-01- 160840E-01- 160785E-01-	1 2 2 4 7 E - 0 1 1 3 1 9 1 6 E - 0 1 1 3 1 5 9 1 E - 0 1 1 3 1 2 8 8 E - 0 1 1 4 1 0 2 9 E - 0 1 1 4 0 6 4 1 E - 0 1 1 4 0 7 8 5 E - 0 1 1 4 0 3 6 0 E - 0 1
2 3 4 5 6 7 8 9 10 11	7.2577E-03 1.1204E-02 1.9243E-02 1.9430E-02 2.8450E-02 3.3370E-02 3.3870E-02 4.4204E-02 5.0158E-02 5.0472E-02	PRUBLEM 1 742825E-03 1-1202E-02 1-5240E-02 1-9428E-02 2-8448E-02 3-3859E-02 3-8612E-02 4-4204E-02 5-0159E-02 5-6474E-02 6-3128E-02	6. \$£AL 30 31. 32. 33. 35. 35. 36. 37. 38. 39. 40.	AR FLUX (680 1.3154E-01 1.3150E-01 1.3605E-01 1.3767E-01 1.3764E-01 1.3795E-01 1.3911E-01 1.3911E-01 1.3653E-01 1.344E-01 1.344E-01	UF-27F.T# ## 19406	10 1036738-01 10 1035678-01 11 1033918-01 12 1031418-01 13 1028278-01 14 10488-01 10 10488-01 10 10488-01 10 100318-01 10 10028-01	13391E-01 13144E-01 132627E-01 132627E-01 141977E-01 141977E-01 141049E-01 140935E-01	88 69 90 91 92 93 95 95	162371E-01- 182247E-01- 161917E-01- 161992E-01- 181290E-01- 181031E-01- 180840E-01- 180906E-01-	1 2 2 4 7 E - 0 1 1 3 1 9 1 6 E - 0 1 - 1 3 1 5 9 1 E - 0 1 1 3 1 2 8 8 E - 0 1 1 3 1 0 2 9 E - 0 1 1 4 0 0 7 8 9 E - 0 1
2 3 4 5 6 7 8 9 10 11 12 13	7.2577E-03 1.1204E-02 1.5243E-02 1.9430E-02 2.3817E-02 2.3817E-02 3.3370E-02 3.6613E-02 4.4204E-02 5.6672E-02 6.3124E-02	PRUBLEM 1 742825E-03 1-1202E-02 1-5240E-02 1-5240E-02 2-3815E-02 2-8440E-02 3-36512E-02 4-4204E-02 5-0159E-02 5-0474E-02 6-3128E-02 7-0066E-02	6. SEAL 30 31 12 12 13 13 13 13 15 15 15 15 15 15 15 15 15 15 15 15 15	AR FLUX (680 1.8194E-01 1.3400E-01 1.3405E-01 1.3767E-01 1.3891E-01 1.3995E-01 1.3911E-01 1.3911E-01 1.3436E-01 1.3436E-01 1.3164E-01 1.2031E-01	UF-27F.T# ## 13400 # 105	## 103673E-01 B1 143507E-01 B2 143507E-01 B3 14387E-01 B4 142437E-01 B4 142437E-01 B5 142437E-01 B6 141682E-01 B7 141048E-01	1 3 3 9 1 E - 0 1 1 3 1 4 4 E - 0 1 1 3 2 6 2 7 E - 0 1 1 2 4 3 8 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 9 6 E - 0 1 1 4 1 0 9 3 7 E - 0 1 1 4 1 0 6 1 E - 0 1 1 4 1 3 8 E - 0 1 1 4 1 9 8 4 E - 0 1	88 69 91 92 93 94 95 97 98	1629718-01- 12247E-01- 141917E-01- 141592E-01 141290E-01 141031E-01 14084E-01- 14084E-01- 14083E-01- 9-7956E-02- 9-1399E-02	1 2 2 4 7 E - 0 1 1 3 1 9 1 6 E - 0 1 1 3 1 9 9 1 E - 0 1 1 4 1 2 8 8 E - 0 1 1 4 1 0 2 9 E - 0 1 1 4 0 6 4 1 E - 0 1 1 4 0 8 2 E - 0 1 1 4 0 3 6 0 E - 0 1 9 4 1 3 8 2 E - 0 2 8 4 3 6 7 E - 0 2
2 3 4 5 6 7 8 9 10 11 12 13	7.2577E-03 1.1204E-02 1.5243E-02 1.5243E-02 2.3817E-02 2.3850E-02 3.3370E-02 3.6513E-02 4.4204E-02 5.0158E-02 6.3124E-02 7.00061E-02	PROBLEM 1 742825E-03 1-1202E-02 1-5240E-02 1-5240E-02 2-3815E-02 2-38448E-02 3-3859E-02 3-4504E-02 3-6574E-02 3-674E-02 3-674E-02 7-7198E-02	6. \$CAL 30. 31. 32. 33. 35. 35. 36. 37. 38. 39. 40. 40. 41. 42.	AR FLUX (680 1.3154 E-01 1.3154 E-01 1.3400 E-01 1.3767 E-01 1.3767 E-01 1.3764 E-01 1.3911 E-01 1.361 E-01 1.364 E-01 1.2631 E-01 1.2631 E-01	UF-27-TE 88	## 103673E-01 B1 143507E-01 B2 143507E-01 B3 14387E-01 B4 142437E-01 B4 142437E-01 B5 142437E-01 B6 141682E-01 B7 141048E-01	1 3 3 9 1 E - 0 1 1 3 1 4 4 E - 0 1 1 4 2 6 2 7 E - 0 1 1 4 2 4 3 8 E - 0 1 1 4 1 3 6 1 E - 0 1 1 4 1 3 6 1 E - 0 1 1 4 1 3 6 1 E - 0 1 1 4 1 3 6 1 E - 0 1 1 4 1 3 3 5 E - 0 1 1 4 1 3 4 5 E - 0 1 1 4 2 4 3 8 E - 0 1	88 69 90 91 92 93 94 96 97 99	1629718-01- 1622476-01- 161978-01- 1619928-01- 1618928-01- 1608408-01- 160888-01- 160888-01- 160888-01- 9479568-02- 843808-02- 843808-02- 843808-02-	2247E-01 181916E-01 18198E-01 181288E-01 181029E-01 180829E-01 180829E-01 180829E-01 180829E-01 981382E-02 981382E-02 787189E-02
2 3 4 5 6 7 8 9 10 11 12 13	7.2577E-03 1.1204E-02 1.5243E-02 1.9430E-02 2.3817E-02 2.3817E-02 3.3370E-02 3.6613E-02 4.4204E-02 5.6672E-02 6.3124E-02	PRUBLEM 1 742825E-03 1-1202E-02 1-5240E-02 1-5240E-02 2-3815E-02 2-8440E-02 3-36512E-02 4-4204E-02 5-0159E-02 5-0474E-02 6-3128E-02 7-0066E-02	6. SEAL 30 31 12 12 13 13 13 13 15 15 15 15 15 15 15 15 15 15 15 15 15	AR FLUX (680 1.3154E-01 1.3154E-01 1.3400E-01 1.3767E-01 1.3767E-01 1.3764E-01 1.3955E-01 1.3911E-01 1.3653E-01 1.3458E-01 1.3458E-01 1.2431E-01 1.2431E-01	UF-27F.T# ## 13400 # 105	10 1030738-01 10 1035678-01 11 10335678-01 12 1033478-01 13 1028278-01 14 10488-01 15 110488-01 16 110488-01 17 110628-01 17 113808-01 11 113808-01 12 113908-01 13 124378-01	143391E-01 143144E-01 14267E-01 14267E-01 141977E-01 141977E-01 14196E-01 140939E-01 140939E-01 141964E-01 141964E-01 142439E-01 14831E-01	88 69 90 91 92 93 94 95 96 97 99 100	1629718-01- 112247E-01- 14197E-01- 141592E-01 141290E-01 141031E-01 140906E-01 1407858-01- 1407858-01- 947956E-02 941399E-02 844380E-02 747198E-02	2247E-01 181916E-01 181928E-01 181288E-01 181029E-01 180785E-01 18080E-01 18080E-01 18080E-01 18080E-02 18080E-02 18080E-02 18080E-02 18080E-02 18080E-02
2 3 4 5 6 7 8 9 0 11 12 13 14 15 16 17	7.2577E-03 1.1204E-02 1.5243E-C2 1.5243E-C2 1.5430E-02 2.68450E-02 3.3370E-02 3.6613E-02 5.6472E-02 5.6472E-02 6.3124E-02 7.0061E-02 7.7189E-02 8.4367E-02 9.1382E-02	PRUBLEM 1 742825E-03 1-1202E-02 1-5240E-02 1-5240E-02 2-3815E-02 2-3815E-02 3-3652E-02 3-6512E-02 3-6474E-02 3-126E-02 7-198E-02 3-139E-02 3-139E-02 2-1396E-02 2-1396E-02	6 \$CAL 30 312 32 33 34 35 37 38 39 40 412 43 44 45 46	AR FLUX (680 1.3154 E-01 1.3154 E-01 1.3400 E-01 1.3605 E-01 1.3767 E-01 1.391 E-01 1.391 E-01 1.391 E-01 1.364 E-01 1.263 E-01 1.263 E-01 1.108 4 E-01 1.108 4 E-01 1.108 4 E-01 1.108 4 E-01 1.108 1 E-01 1.108 1 E-01	UF-27-TE 88	## 1 - 36 73 £ - 61 B1	1 3 3 9 1 E - 0 1 1 3 1 4 4 E - 0 1 1 3 2 6 2 7 E - 0 1 1 2 4 3 8 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 9 4 E - 0 1 1 4 0 9 3 9 E - 0 1 1 4 1 0 6 1 E - 0 1 1 4 1 3 5 E - 0 1 1 2 4 3 9 E - 0 1 1 3 1 6 4 E - 0 1 1 3 1 4 5 E - 0 1 1 3 1 3 4 5 E - 0 1 1 3 1 4 3 6 E - 0 1	88 69 90 91 92 93 94 95 96 97 99 100	1629718-01- 1622476-01- 161978-01- 1619928-01- 1618928-01- 1608408-01- 160888-01- 160888-01- 160888-01- 9479568-02- 843808-02- 843808-02- 843808-02-	2247E-01 181916E-01 18198E-01 181288E-01 181029E-01 180829E-01 180829E-01 180829E-01 180829E-01 981382E-02 981382E-02 787189E-02
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	7.2577E-03 1.1204E-02 1.9243E-62 1.9243E-62 2.8847E-02 2.8847E-02 3.3370E-02 3.3370E-02 4.4204E-02 5.0158E-02 6.3124E-02 7.70001E-02 7.7189E-02 8.4367E-02 9.1382E-02 9.7932E-02	PRUBLEM 1 742825E-03 161202E-02 165240E-02 263815E-02 263815E-02 363612E-02 464204E-02 566474E-02 566474E-02 767066E-02 77198E-02 864380E-02 961399E-02 97366E-02 16363E-01	6. \$CAL 30. 31. 32. 33. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 47.	AR FLUX (680 1.3154 E-01 1.3154 E-01 1.3400 E-01 1.3767 E-01 1.3767 E-01 1.3761 E-01 1.391 E-01 1.391 E-01 1.361 E-01 1.343 E-01 1.343 E-01 1.243 E-01	UF-27-TE (8	10 10 30 73 £ -01 10 10 35 72 £ -01 11 10 35 72 £ -01 12 10 31 44 £ -01 13 10 26 27 £ -01 14 10 26 27 £ -01 15 10 10 10 10 10 10 10 10 10 10 10 10 10	1 3 3 9 1 E - 0 1 1 3 1 4 4 E - 0 1 1 3 2 4 2 E - 0 1 1 3 2 6 2 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 0 9 3 5 E - 0 1 1 4 1 0 9 3 5 E - 0 1 1 5 1 0 6 1 E - 0 1 1 1 2 6 3 1 E - 0 1 1 3 1 6 4 E - 0 1 1 3 4 5 E - 0 1 1 3 4 5 E - 0 1 1 3 4 5 E - 0 1 1 3 6 5 3 E - 0 1	## ## ## ## ## ## ## ## ## ## ## ## ##	1623718-01- 112247E-01- 114197E-01- 1141992E-01 1141091E-01 1141091E-01 1140906E-01 1140906E-01 1140906E-01 947956E-02 941399E-02 941399E-02 747199E-02 643128E-02 946474E-02	2247E-01 181916E-01 18198E-01 181288E-01 181288E-01 181029E-01 180829E-01 180829E-01 180829E-01 180829E-02 941382E-02 941382E-02 84367E-02 77189E-02 78001E-02 56472-02 56472-02 56472-02
23456789011123145671819	7.2577E-03 1.1204E-02 1.5243E-02 1.5243E-02 2.3817E-02 2.3817E-02 3.3370E-02 3.3370E-02 5.0158E-02 5.0158E-02 5.0472E-02 6.3124E-02 7.7189E-02 8.4367E-02 9.7932E-02 1.0360E-01	PRUBLEM 1 742825E-03 1-1202E-02 1-5240E-02 2-5815E-02 2-5815E-02 3-58512E-02 4-4204E-02 5-0159E-02 5-6474E-02 6-3128E-02 7-0066E-02 7-7198E-02 8-4380E-02 9-1399E-02 1-0365E-01	6 \$CAL 301 32 335 35 35 35 36 37 38 40 40 40 40	AR FLUX (680 1.3154E-01 1.3150E-01 1.3605E-01 1.3767E-01 1.3767E-01 1.3767E-01 1.3767E-01 1.3767E-01 1.3767E-01 1.3418E-01 1.3438E-01 1.2631E-01 1.2631E-01 1.164E-01 1.1661E-01 1.0935E-01 1.0935E-01	UFLETF.TE BE SECOND TO SEC	10 10 30 73 £ -01 10 10 35 6 72 -01 10 10 35 6 72 -01 10 10 35 6 72 -01 10 10 35 6 72 -01 10 10 35 6 72 -01 10	1 3 3 9 1 E - 0 1 1 3 1 4 4 E - 0 1 1 3 2 6 2 7 E - 0 1 1 3 2 6 2 7 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 9 6 E - 0 1 1 4 1 9 3 9 E - 0 1 1 4 1 9 3 9 E - 0 1 1 2 4 3 9 E - 0 1 1 2 6 3 1 E - 0 1 1 3 4 3 6 E - 0 1 1 3 4 3 6 E - 0 1 1 3 6 5 5 E - 0 1 1 3 9 1 1 E - 0 1	## # # # # # # # # # # # # # # # # # #	1629718-01- 112247E-01- 114197E-01- 141592E-01 141592E-01 141691E-01 140906E-01 140906E-01 140906E-02 941399E-02 844380E-02 643128E-02 546474E-02 546474E-02	-1 2247E-01 1 1916E-01 1 11288E-01 1 1 1288E-01 1 1 1029E-01 1 1 0061E-01 1 1 0789E-01 1 4 0789E-01 -1 4 0360E-01 9 4 7 9 3 2 E-02 8 4 3 6 7 E-02 7 7 1 8 9 E-02 7 7 1 0 6 E-02 5 6 4 7 2 E-02 4 4 2 0 4 E-02
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	7.2577E-03 1.1204E-02 1.9243E-62 1.9243E-62 2.8847E-02 2.8847E-02 3.3370E-02 3.3370E-02 4.4204E-02 5.0158E-02 6.3124E-02 7.70001E-02 7.7189E-02 8.4367E-02 9.1382E-02 9.7932E-02	PRUBLEM 1 742825E-03 161202E-02 165240E-02 263815E-02 263815E-02 363612E-02 464204E-02 566474E-02 566474E-02 767066E-02 77198E-02 864380E-02 961399E-02 97366E-02 16363E-01	6. \$CAL 30. 31. 32. 33. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 47.	AR FLUX (680 1.3154 E-01 1.3154 E-01 1.3400 E-01 1.3767 E-01 1.3767 E-01 1.3761 E-01 1.391 E-01 1.391 E-01 1.361 E-01 1.343 E-01 1.343 E-01 1.243 E-01	UF-27-TE (8	10 10 30 73 £ -01 10 10 35 72 £ -01 11 10 35 72 £ -01 12 10 31 44 £ -01 13 10 26 27 £ -01 14 10 26 27 £ -01 15 10 10 10 10 10 10 10 10 10 10 10 10 10	1 3 3 9 1 E - 0 1 1 3 1 4 4 E - 0 1 1 3 2 4 2 E - 0 1 1 3 2 6 2 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 9 7 7 E - 0 1 1 4 1 0 9 3 5 E - 0 1 1 4 1 0 9 3 5 E - 0 1 1 5 1 0 6 1 E - 0 1 1 1 2 6 3 1 E - 0 1 1 3 1 6 4 E - 0 1 1 3 4 5 E - 0 1 1 3 4 5 E - 0 1 1 3 4 5 E - 0 1 1 3 6 5 3 E - 0 1	## ## ## ## ## ## ## ## ## ## ## ## ##	1623718-01- 112247E-01- 114197E-01- 1141992E-01 1141091E-01 1141091E-01 1140906E-01 1140906E-01 1140906E-01 947956E-02 941399E-02 941399E-02 747199E-02 643128E-02 946474E-02	2247E-01 181916E-01 18198E-01 181288E-01 181288E-01 181029E-01 180829E-01 180829E-01 180829E-01 180829E-02 941382E-02 941382E-02 84367E-02 77189E-02 78001E-02 56472-02 56472-02 56472-02
2345678901123456789011234567812222	7.2577E-03 1.1204E-02 1.9243E-02 1.9243E-02 2.8450E-02 3.3370E-02 3.3870E-02 4.4204E-02 5.015E-02 5.015E-02 6.3124E-02 7.7189E-02 8.4367E-02 9.7932E-02 1.0360E-01 1.0829E-01 1.0829E-01 1.0829E-01	PRUBLEM 1 742825E-03 1-1202E-02 1-5240E-02 2-5405E-02 2-5405E-02 2-5405E-02 3-5405E-02 3-65476E-02 3-6474E-02 3-6474E-02 3-6474E-02 3-6474E-02 3-6474E-02 1-0465E-01 1-0705E-01 1-0705E-01 1-0705E-01 1-0705E-01 1-0705E-01	6 \$CAL 301 321 335 35 35 36 37 38 40 41 42 44 45 46 46 47 51	AR FLUX (680 1.3154E-01 1.3160E-01 1.3605E-01 1.3767E-01 1.3764E-01 1.3794E-01 1.3795E-01 1.3791E-01 1.3811E-01 1.348E-01 1.348E-01 1.2438E-01 1.1061E-01 1.0035E-01 1.0095E-01 1.0095E-01 1.1049E-01 1.1377E-01	UFLETF.TE (8	10 10 30 73 E-01 10 10 35 67 E-01 11 10 35 67 E-01 12 10 35 67 E-01 13 10 35 67 E-01 14 10 35 67 E-01 15 10 35 67 E-01 15 10 35 67 E-01 15 10 35 E-01 17 10 35 E-01	143391E-01 143144E-01 14267E-01 14267E-01 141977E-01 141977E-01 14196E-01 140939E-01 140939E-01 141964E-01	8890 9122 9445 967 967 970 1001 1004 1007 1007	1629718-01- 112247E-01- 114197E-01- 1141992E-01 1141091E-01 1141091E-01 1141091E-01 1140908E-01 1140908E-01 947958E-02 94199E-02 844380E-02 643128E-02 643128E-02 540159E-02 444204E-02 34861EE-02	-1 2 2 4 7 E - 0 1 1 3 19 16 E - 0 1 1 3 19 16 E - 0 1 1 3 12 8 8 E - 0 1 1 3 12 8 8 E - 0 1 1 3 10 2 9 E - 0 1 1 4 0 7 8 9 E - 0 1 1 4 0 7 8 9 E - 0 1 1 4 0 7 8 9 E - 0 1 1 4 0 7 8 9 E - 0 2 9 4 13 0 2 E - 0 2 9 4 13 0 2 E - 0 2 7 7 1 8 9 E - 0 2 7 7 1 8 9 E - 0 2 7 5 6 4 7 2 E - 0 2 4 4 2 0 4 E - 0 2 3 8 6 7 3 E - 0 2 3 8 6 7 3 E - 0 2 3 8 3 7 0 E - 0 2 3 8 4 5 0 E - 0 2 3 8 4 7 0 E - 0 2
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	1.0384E+00	1.15878+00		-1.56078400	79	1453906400-1353586400) 107 1.46612-01	-1.2599E-01
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23	1.2651E+00	1.3629E+00	52. <u>-1.61216+00</u> .	116443E+00	16	±2 % 2 6 R F 4 D D · . 1 1 4 1 7 1 5 4 D C	i ing linklokini	
24	1.3629E+00	1.4533E+00	53 1464938+00	1.67712760	ì	351218700 1449178400 3449178400 - 1446578400 846578400 - 1443428400	110 / 8.83848-02	7422406-02
25	1.4532E+00	1.5364E+00		-1.49636400	- 11	Bladiteink Tracktein	- 111 - 7.2206 E-01	\$171796-02
26	1.5363E+00	1.6120E+00		1.70788400	8		7- 1117-2200801	
27	1.6120E+00	1.6800E+00		1.7189E+86	27	104031E400 % 104345E400	115 3913485-08	4.3518E-02
28	1.6799E+00					144657E+00; 144342E+0	113 4.8445E-05	\$10127E-02
		1.7401E+00		*-1.7039Ef00		\$1 1973E+00 111549E+00	114 1.0116E-02	1.53066-02
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i		PROBLEM 1	6-AL SCÁLAR FLUÍ (ckout_z_f_T	rioise E			*
i	5.9027E-03	1.4939E-02	6-Al SCÁLAR FLUT (30 217266E-01	6 kaup 2 4 41 24776 E # 67	erioise	245010E-D1 244684E-0	of £10930E-01	2.04478-01
2	1.4889E-02	1.4939E-02 2.2980E-02	6-AL SCÁLAR FLUÍ (6 kaup 2 4 41 24776 E # 67	erioise	245010E-D1 244684E-0	of £10930E-01	2.0447E-01 -1.0935E-01
	1.4889E-02 2.2985E-02	1.4939E-02 2.2980E-02 3.1265E-02	6-Al SCÁLAR FLUT (30 217266E-01	6 kaup 2 4 41 24776 E # 67	eriojs.	245010F-01 245084E-01 24584E-01 24230E-01 24230E-01 244230E-01	67 2409362-01 - 88 240446-01	-1.9935E-01
2	1.4889E-02 2.2985E-02	1.4939E-02 2.2980E-02	6-A1 SCÁLAR FLUÍ (30 217266E-61 31 217764E-01 32 240167E-01	ckoup_2.5 ??! 2.7704E=0? 2.8168E=0! 2.8468E=0!	eriojs.	245010F-01 245084E-01 24584E-01 24230E-01 24230E-01 244230E-01	67 2409362-01 - 88 240446-01	-1.9935E-01
2	1.4889E-02 2.2985E-02 3.1270E-02	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02	6-A1 SCÂLAR FLUÍ (30 2:7266E-01 31 2:7764E-01 32 2:40167E-01 33 2:8468E-01	6 4 0 4 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	60 60 61 62	245010F-01 245084E-01 24584E-01 24230E-01 24230E-01 244230E-01	67 2409362-01 - 88 240448-01	-1.9935E-01 1.9418E-01 -1.8916E-01
3	1.4889E-02 2.2985E-02 3.1270E-02 3.9860E-02	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02	6-AL SCÂLAR FLUÍ (30 247266E-Ó1 31 247764E-O1 32 248167E-O1 33 248468E-O1 34 24868E-O1	6ROUP_2 .6 .71 247764E=07 248168E=01 248698E=01 248731E=03	60 60 61 62	245010F-01 245084E-01 24584E-01 24230E-01 24230E-01 244230E-01	67 2409362-01 - 88 240448-01	-1.9935E-01 1.9418E-01 -1.8916E-01 1.8453E-01
2 3 4 5 6	1.4889E-02 2.2985E-02 3.1270E-02 3.9860E-02 4.8860E-02	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02	6-AL SCÄLAR FLUT (30 247266E-01 31 247764E-01 32 248167E-01 33 248468E-01 34 248638E-01 35 248731E-01	CROUP_2_6_TT 2.7764E=01 2.8160E=01 8E=010E=01 2.600E=01 2.6731E=01 2.603E=01	10 12 10 12 10 10 10 10 10 10 10 10 10 10 10 10 10	\$\$ 9010 F= 01	67 2.09362-01 88 2.04462-01 89 1.99362-01 90 1.94202-01 91 1.889182-01 92 1.88932-01	-1.9935E-01 1.9418E-01 -1.8916E-01 1.8451E-01 -1.8059E-01
2 3 4 5 6 7	1.4889E-02 2.2985E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8366E-02	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02	6-A1 SCÉLAR FLUÍ (30 247266E-01 31 247764E-01 32 248167E-01 33 248468E-01 34 248638E-01 35 248731E-01 36 248688E-01	GROUP_2_4_TT 2.7768##07 2.8168#=07 2.8168#=01 2.8658#=01 2.6711=01 2.8658#=01 2.86510#=07	Man is a second of the second	% 1010 F-01 1 2 4 4 8 0 8 F-0 2 4 2 3 0 E-01 2 4 2 3 0 E-01 2 4 2 3 0 E-01 2 4 2 5 0 E-01 2 4 3 6 5 0 E-01 2 4 2 9 4 4 E-01 2 4 2 1 1 2 E-01 2 4 1 1 5 0 E-01 4 4 1 1 3 8 E-01 1 4 9 9 1 7 E-01	1 87 240988-01 88 240448-01 89 149936-01 90 149428-01 91 1486186-01 92 1486928-01 93 6146628-01	-1.9935E-01 1.9418E-01 -1.8916E-01 1.8451E-01 1.8659E-01 1.4777E-01
2 3 4 5 6 7 8	1.4889E-02 2.2985E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02	6-AL SCÂLAR FLUÍ (30	GROUP 2 . TO 2.7768 = 57 2.8186 = 57 2.8186 = 57 2.8488 = 67 2.8731 = 67 2.883 = 67 2.883 = 67 2.883 = 67 2.883 = 67 2.883 = 67 2.883 = 67	Man is a second of the second	% 1010 F-01 1 2 4 4 8 0 8 F-0 2 4 2 3 0 E-01 2 4 2 3 0 E-01 2 4 2 3 0 E-01 2 4 2 5 0 E-01 2 4 3 6 5 0 E-01 2 4 2 9 4 4 E-01 2 4 2 1 1 2 E-01 2 4 1 1 5 0 E-01 4 4 1 1 3 8 E-01 1 4 9 9 1 7 E-01	1 67 2409362-01 88 2404462-01 89 1499362-01 90 1499362-01 91 1489382-01 92 1489382-01 91 1489382-01	-1.9935E-01 1.9418E-01 -1.8916E-01 1.8453E-01 1.8653E-01 1.4777E-01 -1.4778E-01
23456789	1.4889E-02 2.2985E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8366E-02 5.8366E-02 7.9219E-02	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 9.0691E-02	6-AL SCÂLAR FLUÍ (30 2.7266E-61 31 2.7764E-01 32 2.68167E-01 33 2.68760E-01 34 2.86731E-01 35 2.86731E-01 37 2.85731E-01 37 2.85710E-01 38 2.8211E-01	GROUP_2 4 TT 241784E=01 24848E=01 24848E=01 24889E=01 24889E=01 24889E=01 24821E=01 24821E=01 247783E=01	50 50 50 61 64 64	244010F-01 1 2440848-0 244230E-01 244230E-01 244230E-01 24450E-01 243650E-01 2429448-01 242112E-01 241150E-01 24112E-01 149917E-01 24992E-01 149917E-01 24992E-01 14990E-01	### ##################################	-1.9938E-01 1.9418E-01 -1.8916E-01 1.8939E-01 1.8039E-01 1.774E-01 1.764E-01
2 3 4 5 6 7 8 9	1.4889E-02 2.2985E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02 7.9219E-02 9.0692E-02	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 9.0691E-02	6-A1 SCÄLAR FLUT (30 2.7266E-01 31 2.7764E-01 32 2.60167E-01 33 2.6663E-01 35 2.60731E-01 36 2.6663E-01 37 2.6510E-01 38 2.8211E-01 39 2.7703E-01	GROUP_2 & \$\frac{1}{2}\$ 241764##87 24166##87 2416468##81 246658##81 246658##81 246611##91 247768##91 24722##01		% 0.0 pc 0 1 2 4 4 8 8 4 6 - 0 2 4 2 3 0 E - 0 2 4 2 3 0 E - 0 2 4 2 3 0 E - 0 2 4 2 3 0 E - 0 2 4 2 3 0 E - 0 2 4 2 3 0 E - 0 2 4 2 3 0 E - 0 2 4 2 3 0 E - 0 2 4 2 3 0 E - 0 2 4 2 3 1 2 E - 0 2 4 2 3 1 3 0 E - 0 1 4 3 0 3 0 E - 0 2 4 3 0 0 E - 0 2 4 3 0 0 E - 0 2 4 3 0 E - 0	### ##################################	-1.9935E-01 1.9418E-01 -1.8916E-01 1.8453E-01 1.8653E-01 1.4777E-01 -1.4778E-01
2 3 4 5 6 7 8 9 10 11	1.4889E-02 2.2985E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02 7.9219E-02 9.0692E-02 1.0291E-01	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.6856E-02 5.8362E-02 6.8459E-02 7.9217E-02 9.0691E-02 1.0291E-01 1.1587E-01	6-AL SCÂLAR FLUÍ (30 247266E-ÓÍ 31 247764E-OÍ 32 248167E-ÓI 34 248468E-ÓI 35 2486731E-ÓI 36 24868E-ÓI 37 248731E-ÓI 38 24868E-ÓI 39 24868E-ÓI 39 24868E-ÓI 39 24868E-ÓI 39 24868E-ÓI 39 248731E-ÓI 39 247783E-ÓI	GROUP 2 4 7 7 8 4 8 4 7 8 4 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 8 4 8		244010F-01 244084F-0 244230E-01 24450E-01 244230E-01 24450E-01 243650E-01 242944F-01 242112E-01 241150E-01 24112E-01 14997E-01 24983E-01 149906E-01 24983E-01 14988E-01 24984E-01 14988E-01 24984E-01 14988E-01	67 2409362-01 88 240448-01 89 1499361-01 90 1499362-01 91 1489182-01 92 1488952-01 94 147762-01 95 147892-01 96 147892-01 97 1470022-01	-1.9938E-01 1.9418E-01 -1.8916E-01 1.8939E-01 1.8039E-01 1.774E-01 1.764E-01
2 3 4 5 6 7 8 9 10 11 12	1.4889E-02 2.2785E-02 3.1270E-02 3.9860E-02 5.8366E-02 5.8366E-02 7.9219E-02 9.0692E-02 1.0291E-01 1.1587E-01	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 9.0691E-02 1.0291E-01 1.158E-01 1.2952E-01	6-AL SCÂLAR FLUÍ (30 2.47266E-01 31 2.47764E-01 32 248167E-01 33 2.86860E-01 35 2.86731E-01 36 2.8663E-01 37 2.48731E-01 38 2.8211E-01 39 2.7703E-01 40 2.7225E-01 41 2.6538E-01	GROUP_2 4 7 7 8 8 4 7 7 8 8 8 8 6 8 7 8 8 8 8 6 8 8 6 8 8 6 9 8 6 9 8 6 9 8 8 8 8		189010F-D1 244884E-D1 184884E-D1 24480E-D1 184884E-D1 244850E-D1 184884E-D1 242844E-D1 18488E-D1 2428150E-D1 18488E-D1 184917E-D1 18488E-D1 184918E-D1 184908E-D1 18498E-D1 18591E-D1 184918E-D1 18591E-D1 184928E-D1 18591E-D1 184934E-D1	### #################################	-1.0939E-01 1.0418E-01 -1.8018E-01 1.8453E-01 1.8059E-01 1.777E-01 -1.778E-01 1.778E-01
2 3 4 5 6 7 8 9 10 11 12 13	1.4889E-02 2.2985E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02 7.9219E-02 9.0692E-02 1.0291E-01	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.6856E-02 5.8362E-02 6.8459E-02 7.9217E-02 9.0691E-02 1.0291E-01 1.1587E-01	6-AL SCÂLAR FLUÍ (30 247266E-ÓÍ 31 247764E-OÍ 32 248167E-ÓI 34 248468E-ÓI 35 2486731E-ÓI 36 24868E-ÓI 37 248731E-ÓI 38 24868E-ÓI 39 24868E-ÓI 39 24868E-ÓI 39 24868E-ÓI 39 24868E-ÓI 39 248731E-ÓI 39 247783E-ÓI	GROUP 2 4 7 7 8 4 8 4 7 8 4 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 8 4 8		## 1010 1 244	### ##################################	-1.9925E-01 1.9418E-01 1.88918E-01 1.8893E-01 1.871718E-01 1.8718E-01 1.87698E-01 1.8096E-01 1.8096E-01
2 3 4 5 6 7 8 9 10 11 12	1.4889E-02 2.2785E-02 3.1270E-02 3.9860E-02 5.8366E-02 5.8366E-02 7.9219E-02 9.0692E-02 1.0291E-01 1.1587E-01	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 9.0691E-02 1.0291E-01 1.158E-01 1.2952E-01	6-AL SCÂLAR FLUÍ (30 2.47266E-01 31 2.47764E-01 32 248167E-01 33 2.86860E-01 35 2.86731E-01 36 2.8663E-01 37 2.48731E-01 38 2.8211E-01 39 2.7703E-01 40 2.7225E-01 41 2.6538E-01	GROUP_2 & TT 241704E=01 24040E=01 24040E=01 240711E=01 240711E=01 24081E=01 24081E=01 24081E=01 24081E=01 247703E=01 267703E=01 267703E=01 267703E=01 267709E=01		24 0 10 F 0 1 24 0 8 F 0 0 1 2 4 2 10 E 0 0 1 2 4 2 1 1 E 0 0 1 2 4 1 1 5 8 E 0 1 1 2 4 1 1 5 8 E 0 1 1 2 4 1 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 0 E 0 0 1 1 4 0 0 0 1 E 0 0 1 1 4 0 0 0 E 0 0 1 1 4 0 0 0 1 E 0 0 1 1 4 0 0 0 E 0 0 E	67 2409362-01 88 2404482-01 89 1499362-01 90 1498202-01 91 1489382-01 92 1489382-01 93 1476932-01 95 1476932-01 96 1476932-01 97 1470022-01 98 1469752-01 99 149952-01	-1.9939E-01 1.9418E-01 1.8918E-01 1.8918E-01 1.88039E-01 1.4774E-01 1.47698E-01 1.4698E-01 1.4698E-01 1.48087E-01 1.48087E-01
2 3 4 5 6 7 8 9 10 11 12 13	1.4889E-02 2.2785E-02 3.1276E-02 3.9860E-02 4.8060E-02 6.8462E-02 7.9219E-02 9.0692E-02 1.0291E-01 1.1587E-01 1.2952E-01	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.4376E-01 1.5840E-01	6-A1 SCÂLAR FLUÍ (30 247266E-Ó1 31 247167E-Ö1 32 248167E-Ö1 33 248460E-Ö1 34 248608E-Ö1 35 248731E-Ö1 36 248638E-Ö1 37 248731E-Ö1 38 248731E-Ö1 39 227783E-Ö1 40 24729E-Ö1 41 24638E-Ö1 42 24719E-Ö1 43 24769E-Ö1	GROUP 2 4 7 7 8 4 8 4 8 9 8 4 7 7 8 4 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8		24 0 10 F 0 1 24 0 8 F 0 0 1 2 4 2 10 E 0 0 1 2 4 2 1 1 E 0 0 1 2 4 1 1 5 8 E 0 1 1 2 4 1 1 5 8 E 0 1 1 2 4 1 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 1 E 0 0 1 1 4 0 0 0 E 0 0 1 1 4 0 0 0 1 E 0 0 1 1 4 0 0 0 E 0 0 1 1 4 0 0 0 1 E 0 0 1 1 4 0 0 0 E 0 0 E	67 2409362-01 88 2404482-01 89 1499362-01 90 1498202-01 91 1489382-01 92 1489382-01 93 1476932-01 95 1476932-01 96 1476932-01 97 1470022-01 98 1469752-01 99 149952-01	-1.9938E-01 1.9918E-01 1.8918E-01 1.8819E-01 1.8819E-01 1.8717E-01 1.87784E-01 1.4698E-01 1.4698E-01 1.3841E-01 1.2663E-01
2 3 4 5 6 7 8 9 10 11 12 13 14	1.4889 E-02 2.2785 E-02 3.1270 E-02 3.9860 E-02 4.8860 E-02 5.8366 E-02 6.8462 E-02 7.9219 E-02 1.0291 E-01 1.1587 E-01 1.2952 E-01 1.4375 E-01 1.5838 E-01	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.5840E-01 1.5840E-01 1.7314E-01	6-AL SCÂLAR FLUÍ (30 2.7266E-61 31 2.7764E-01 32 248167E-01 33 2.8686E-61 35 2.86731E-01 36 2.8663E-01 37 2.8773E-01 38 2.8211E-01 39 2.7703E-01 40 2.7225E-01 41 2.6538E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01	GROUP 2 4 7 7 8 4 8 4 7 8 4 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 8 4 8		24 9010 F-01 24 40 84 F-0: 24 42 30 E-01 24 24 50 E-0: 24 36 50 E-01 24 29 44 E-0: 24 24 50 E-01 24 29 15 0E-0: 24 21 12 E-01 24 21 11 E-0: 24 21 12 E-01 14 90 17 E-0: 24 30 30 E-01 14 90 30 E-0: 24 30 30 E-01 14 90 30 E-0: 24 30 30 E-01 14 90 31 E-0: 24 30 30 E-01 14 90 31 E-0: 24 30 30 E-01 14 91 26 E-0: 24 30 30 E-01 24 30 37 E-0: 24 30 30 E-01 24 30 37 E-0: 24 30 30 E-01 24 30 30 E-0: 24 30 30 E-01 24 30 50 E-0: 24 30 30 E-01 24 30 E-0: 24 30 50 E-01 24 30 E-0: 24 30 E-01 24	### ##################################	-1.9938E-01 1.9918E-01 1.8918E-01 1.8813E-01 1.8853E-01 1.7778-01 1.4768E-01 1.4606E-01 1.4606E-01 1.2608E-01 1.2608E-01
234567890112314567	1.4889E-02 2.2785E-02 3.1270E-02 3.97860E-02 4.8860E-02 5.8366E-02 7.9219E-02 9.0692E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4375E-01 1.5838E-01 1.7331E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2587E-01 1.5840E-01 1.7314E-01 1.7314E-01	6-AL SCÄLAR FLUT (30 2.7266E-61 31 2.7764E-01 32 248167E-01 33 2.8686E-01 35 2.86731E-01 36 2.8663E-01 37 2.8773E-01 38 2.8211E-01 39 2.7703E-01 40 2.7225E-01 41 2.6938E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01	GROUP_2 4 7 1 241784 E 4 8 1 241784 E 4 8 1 24048 E 4 8 1 24048 E 4 9 1 2405 E 1 2		## 1010 10 10 10 10 10 10	### #################################	-1.9935E-01 1.9418E-01 1.8815E-01 1.8815E-01 1.8815E-01 1.8715E-01 1.8715E-01 1.87695E-01 1.8696E-01 1.8696E-01 1.8696E-01 1.8696E-01 1.8696E-01 1.9696E-01 1.9696E-01
234567890112314567	1.4889 E-02 2.2785 E-02 3.1270 E-02 3.7860 E-02 4.8060 E-02 5.8366 E-02 6.8462 E-02 7.9219 E-02 1.0291 E-01 1.1587 E-01 1.295 E-01 1.4375 E-01 1.7311 E-01 1.8751 E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4376E-01 1.5840E-01 1.8755E-01 1.8755E-01 2.8755E-01	6-AL SCÄLAR FLUT (30 2.7266E-61 31 2.7764E-01 32 248167E-01 33 2.8686E-01 35 2.86731E-01 36 2.8663E-01 37 2.8773E-01 38 2.8211E-01 39 2.7703E-01 40 2.7225E-01 41 2.6938E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01	GROUP 2 4 7 7 8 4 8 4 8 7 8 4 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 8 4 8		## 1010 10 10 10 10 10 10	67 240536E-01 88 - 240446E-01 89 14935E-01 90 14935E-01 91 14893E-01 92 14893E-01 93 147693E-01 94 147693E-01 97 14702E-01 98 16071E-01 99 16495E-01 100 13843E-01 101 16265E-01 102 16199E-01	-1.9938E-01 1.8916E-01 1.8916E-01 1.8916E-01 1.8716E-01 1.87784E-01 1.47784E-01 1.4698E-01 1.4698E-01 1.2663E-01 1.494E-01 1.494E-01 1.494E-01 1.494E-01 1.494E-01
23456789011231456718	1.4889E-02 2.2785E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02 7.9219E-01 1.0291E-01 1.2793E-01 1.4375E-01 1.4375E-01 1.7311E-01 1.8751E-01 1.8751E-01	1.4939E-02 2.2980E-02 3.1265E-02 3.9856E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.5840E-01 1.7314E-01 1.6759E-01 2.0100E-01 2.1265E-01	6-AL SCÄLAR FLUT (30 2.7266E-01 31 2.7764E-01 32 248167E-01 33 2.8686E-01 35 2.86731E-01 36 2.8663E-01 37 2.8773E-01 38 2.8211E-01 39 2.7703E-01 40 2.7225E-01 41 2.6538E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01 45 2.2210E-01 46 2.1603E-01 47 2.1295E-01	GROUP 2 4 7 1 2 4 7 1 3 4 7 1 3 4 5 4 5 4 5 4 5 4 5 5 5 5 5 5 5 5 5 5	156 156 156 156 156 156 156 157 157 157 156 156 156 156 156 156 156 156 156 156	## # # # # # # # # # # # # # # # # # #	67 2409362-01 88 2404482-01 89 1499362-01 90 1494202-01 91 1484182-01 92 1484522-01 93 1476932-01 95 1476932-01 96 1476932-01 97 1470022-01 98 1460712-01 99 149952-01 100 138432-01 101 1426552-01 102 14952-01 103 149356-01 104 9426452-02	-1.9928E-01 1.69418E-01 1.684518E-01 1.884518E-01 1.87178E-01 1.47178E-01 1.4718E-01 1.47698E-01 1.4007E-01 1.4008E-01 1.2608E-01 1.2608E-01 1.2608E-01 1.2628E-02 1.2628E-02
23456789111231456789	1.4889 E-02 2.2785 E-02 3.1270 E-02 3.9860 E-02 5.8366 E-02 5.8366 E-02 9.0692 E-02 1.0291 E-01 1.2952 E-01 1.4375 E-01 1.5875 E-01 1.5838 E-01 1.7311 E-01 1.6751 E-01 2.0095 E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 6.8856E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2587E-01 1.5840E-01 1.7314E-01 1.7314E-01 2.2132E-01	6-AL SCÄLAR FLUT (30 2.7266E-61 31 2.7764E-01 32 2.48167E-01 33 2.88468E-01 35 2.86731E-01 36 2.86731E-01 37 2.87782E-01 40 2.7229E-01 41 2.6938E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01 45 2.2210E-01 47 2.1295E-01 48 2.1216E-01	GROUP-2 479 247784848 247848848 248488401 248518240 248518240 248518240 248518240 247783840 247783840 24789840 24789840 24789840 24789840 241895840 241895840 241895840 241895840 241895840 241895840 241895840	150 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	##010F=01	### ##################################	-1.9935E-01 1.9915E-01 1.8915E-01 1.8915E-01 1.8755E-01 1.7758E-01 1.7595E-01 1.4695E-01 1.4695E-01 1.4695E-01 1.4695E-01 1.2663E-01 1.2663E-01 1.2652E-02 842252E-02
23456789011234567690	1.4889E-02 2.2785E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8836E-02 7.9219E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4375E-01 1.7311E-01 2.0095E-01 2.1259E-01 2.1259E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 6.8459E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4376E-01 1.7314E-01 1.7314E-01 2.0100E-01 2.1265E-01 2.2132E-01 2.2132E-01	6-AL SCÄLAR FLUÍ (30	GROUP 2 478 E + 67 2478 A E + 67 248 B + 68 E + 68	15 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	## 1010 1	### ##################################	-1.9928E-01 1.69418E-01 1.684518E-01 1.884518E-01 1.87178E-01 1.47178E-01 1.4718E-01 1.47698E-01 1.4007E-01 1.4008E-01 1.2608E-01 1.2608E-01 1.2608E-01 1.2628E-02 1.2628E-02
23456789011234567789011234567789021	1.4889 E-02 2.2785 E-02 3.1270 E-02 3.9860 E-02 4.8860 E-02 5.8366 E-02 6.8462 E-02 7.9219 E-01 1.0291 E-01 1.295 E-01 1.4375 E-01 1.6751 E-01 1.6751 E-01 2.0095 E-01 2.1259 E-01 2.2132 E-01 2.2213 E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 6.8856E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2587E-01 1.5840E-01 1.7314E-01 1.7314E-01 2.2132E-01	6-AL SCÄLAR FLUT (30 2.7266E-61 31 2.7764E-01 32 2.48167E-01 33 2.88468E-01 35 2.86731E-01 36 2.86731E-01 37 2.87782E-01 40 2.7229E-01 41 2.6938E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01 45 2.2210E-01 47 2.1295E-01 48 2.1216E-01	GROUP-2 479 247784848 247848848 248488401 248518240 248518240 248518240 248518240 247783840 247783840 24789840 24789840 24789840 24789840 241895840 241895840 241895840 241895840 241895840 241895840 241895840	150 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	##010F=01	67 240536E-01 88 - 240446E-01 89 14935E-01 90 149320E-01 91 149320E-01 92 148932E-01 94 14768E-01 95 14768E-01 96 147695E-01 97 14702E-01 99 14995E-01 100 13843E-01 101 16265E-01 102 1195E-01 103 16356E-01 104 942645E-02	-1.9935E-01 1.9915E-01 1.8915E-01 1.8915E-01 1.8755E-01 1.7758E-01 1.7595E-01 1.4695E-01 1.4695E-01 1.4695E-01 1.4695E-01 1.2663E-01 1.2663E-01 1.2652E-02 842252E-02
234567890111231456769012222	1.4889E-02 2.2785E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8836E-02 7.9219E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4375E-01 1.7311E-01 2.0095E-01 2.1259E-01 2.1259E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 6.8459E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4376E-01 1.7314E-01 1.7314E-01 2.0100E-01 2.1265E-01 2.2132E-01 2.2132E-01	6-AL SCÄLAR FLUÍ (30	GROUP 2 478 E + 67 2478 A E + 67 248 B + 68 E + 68	15 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	## 1010 1 244	67 2409362-01 88 240448-01 89 1499365-01 90 1494202-01 91 1484182-01 92 1484952-01 93 1476932-01 95 1476932-01 96 1476932-01 97 1470025-01 98 1460712-01 99 149932-01 100 138432-01 101 142652-01 102 14932-01 103 14932-01 104 9426492-02 105 8422832-02 106 7425132-02 107 \$433392-02	-1.9928E-01 1.69418E-01 1.684518E-01 1.684518E-01 1.684518E-01 1.47148E-01 1.47148E-01 1.46948E-01 1.46948E-01 1.26658E-01 1.26658E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.1494E-01
23456789011234567789011234567789021	1.4889 E-02 2.2785 E-02 3.1270 E-02 3.9860 E-02 4.8860 E-02 5.8366 E-02 6.8462 E-02 7.9219 E-01 1.0291 E-01 1.295 E-01 1.4375 E-01 1.6751 E-01 1.6751 E-01 2.0095 E-01 2.1259 E-01 2.2132 E-01 2.2213 E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 6.8362E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.252E-01 1.5840E-01 1.5840E-01 1.875E-01 1.875E-01 2.0100E-01 2.1265E-01 2.2132E-01 2.2257E-01	6-AL SCÂLAR FLUÍ (30 2.7266E-Ó1 31 2.7764E-O1 32 248167E-Ó1 33 2.86860E-Ó1 34 2.8658E-O1 35 2.8658E-O1 36 2.8669E-O1 37 2.8778E-O1 40 2.7783E-O1 41 2.6538E-O1 42 2.5719E-O1 43 2.4769E-O1 44 2.3691E-O1 45 2.210E-O1 46 2.1603E-O1 47 2.1295E-O1 48 2.1205E-O1 49 2.1367E-O1 50 2.1898E-O1	GROUP 2 4 7 7 8 4 8 4 7 7 8 4 8 4 8 7 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 4 8 8 8 4 8	15011238149 01 01 12 13 15 15 15 15 15 15 15 15 15 15 15 15 15	## 1010 1	### ##################################	-1.9938E-01 1.49418E-01 1.68418E-01 1.684318E-01 1.67418E-01 1.6748E-01 1.6768E-01 1.4606FE-01 1.2643E-01 1.2643E-01 1.2643E-01 1.2643E-01 1.2643E-02 7.2514E-02 6.3341E-02 9.446666E-02
234567890111231456769012222	1.4889 E-02 2.2785E-02 3.1270E-02 3.9860E-02 4.8860E-02 6.8462E-02 7.9219E-02 1.0291E-01 1.2952E-01 1.4375E-01 1.5875E-01 1.5875E-01 1.5875E-01 2.0095E-01 2.1259E-01 2.2132E-01 2.2211E-01 2.2299E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 6.8856E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.295E-01 1.295E-01 1.295E-01 2.216E-01 2.216E-01 2.216E-01 2.2257E-01 2.2257E-01 2.2257E-01 2.2257E-01 2.2361E-01 2.3261E-01	6-AL SCÂLAR FLUÍ (30 2.7266E-61 31 2.7764E-01 32 2.48167E-01 33 2.88468E-01 35 2.86731E-01 36 2.8663E-01 37 2.87783E-01 39 2.7225E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01 45 2.2210E-01 46 2.1603E-01 47 2.1295E-01 48 2.116E-01 49 2.1367E-01 51 2.225E-01 52 2.3653E-01	GROUP-2: 47-71 2477848-87 2477848-87 248488-88-91 248888-91 248888-91 248888-91 248888-91 248888-91 247888-91 247898-91 247898-91 247898-91 242888-91 242888-91 2418978-91 2418978-91 2418978-91 2418978-91 2418978-91 2418978-91 2418978-91 2418978-91 2418978-91 2418978-91 2418978-91 2418978-91	150 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	## 1010 1	### #################################	-1.9938E-01 1.69418E-01 1.68948E-01 1.68453E-01 1.67648E-01 1.67648E-01 1.47648E-01 1.46948E-01 1.46948E-01 1.46948E-01 1.4948E-01 1.4948E-01 1.0456E-01 1.0456E-02 1.2643E-02 1.46668E-02 1.46668E-02 1.46668E-02
2345678901123456789012234	1.4889 E-02 2.2785E-02 3.1276-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02 7.9219E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4375E-01 1.8751E-01 2.0095E-01 2.1259E-01 2.213E-01 2.2211E-01 2.223E-01 2.2682E-01 2.3258E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 5.8362E-02 5.8362E-02 5.8362E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.376E-01 1.376E-01 2.0100E-01 2.1265E-01 2.2132E-01 2.2132E-01 2.2257E-01 2.2257E-01 2.3266E-01 2.3927E-01	6-AL SCÂLAR FLUÍ (30 2.47266E-Ó1 31 2.47764E-O1 32 2.48167E-O1 33 2.8660E-O1 35 2.8663E-O1 36 2.8663E-O1 37 2.8731E-O1 38 2.8211E-O1 39 2.7703E-O1 40 2.723E-O1 41 2.6638E-O1 42 2.5719E-O1 43 2.4769E-O1 44 2.3691E-O1 45 2.2210E-O1 46 2.1603E-O1 47 2.1295E-O1 48 2.1216E-O1 50 2.1898E-O1 51 2.295E-O1 52 2.3653E-O1 53 2.4243E-O1	GROUP-2 6 7 7 8 4 7 8 4 8 8 8 8 8 8 8 8 8 8 8 8 8	15011111111111111111111111111111111111	## 1010 1	67 2405362-01 88 240448-01 89 1499365-01 90 1494202-01 91 1489182-01 92 148932-01 93 1478932-01 94 1477952-01 95 1478932-01 100 148432-01 101 162652-01 102 14992-01 104 9426492-02 105 642832-02 106 7,25132-02 107 4,33392-02 107 4,6652-02 109 4,6652-02 109 4,6652-02 109 4,6652-02	-1.9938E-01 1.6916E-01 1.6816E-01 1.6816E-01 1.6816E-01 1.7774E-01 1.7776E-01 1.4769E-01 1.40076E-01 1.40076E-01 1.40036E-01 1.404E-01 1.1494E-01 1.1494E-01 1.1494E-01 1.265E-01 1.265E-01 1.404E-01 1.404E-01 1.404E-01 1.404E-01 1.404E-01 1.404E-01 1.404E-01 1.404E-01 1.404E-01 1.404E-02 1.4140E-02 1.4140E-02 1.4140E-02 1.4140E-02 1.4140E-02 1.4140E-02 1.4140E-02 1.4140E-02 1.4140E-02
23456789011234567890122345	1.4889 E-02 2.2785E-02 3.1270E-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02 7.9219E-01 1.0291E-01 1.2972E-01 1.4375E-01 1.5938E-01 2.0095E-01 2.1259E-01 2.1259E-01 2.2211E-01 2.2259E-01 2.3258E-01 2.3258E-01 2.3258E-01	1.4936E-02 2.2930E-02 3.1205E-02 4.8856E-02 5.88362E-02 6.88459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.5840E-01 1.7314E-01 1.7376E-01 2.1265E-01 2.1265E-01 2.2132E-01 2.22381E-01 2.2257E-01 2.2266E-01 2.3261E-01 2.3261E-01 2.3261E-01 2.3261E-01 2.3261E-01 2.3261E-01 2.3261E-01 2.3266E-01	6-AL SCÂLAR FLUÍ (30 2.47266E-01 31 2.4764E-01 32 248167E-01 33 2.8686BE-01 35 2.86731E-01 36 2.8663E-01 37 2.8773E-01 38 2.8211E-01 39 2.7703E-01 40 2.7225E-01 41 2.6538E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01 45 2.210E-01 46 2.1216E-01 47 2.1295E-01 48 2.1216E-01 50 2.1898E-01 51 2.2925E-01 52 2.46498E-01 53 2.4248E-01	GROUP-2 6 7 7 8 4 7 8 4 8 8 8 8 6 8 6 8 8 6 8 8 8 8 8 8 8 8	1960-1978-187-18-19-19-19-19-19-19-19-19-19-19-19-19-19-	## 1010 1	1 67 2405362-01 88 2404482-01 89 1493562-01 90 1494202-01 91 1484382-01 92 1484382-01 93 1476938-01 94 147762-01 95 1476938-01 100 1484382-01 100 1484382-01 101 162658-01 102 144988-01 103 160718-01 104 926458-02 105 8.22838-02 106 7.25138-02 107 3.3398-02 108 3.47388-02 109 4.66658-02 110 3.90648-02 110 3.90648-02	-1.9925E-01 1.49418E-01 1.68916E-01 1.47478E-01 1.47478E-01 1.47478E-01 1.47478E-01 1.4992E-01 1.4992E-01 1.4992E-01 1.4992E-01 1.4992E-01 1.4992E-02 1.4992E-02 3.4742E-02 3.4742E-02 3.4742E-02 3.4742E-02 3.4768E-02 3.1871E-02 3.5903E-02
234567890112345678901223456	1.4889 E-02 2.2785 E-02 3.1270 E-02 3.8860 E-02 5.8366 E-02 5.8366 E-02 7.9219 E-02 1.0291 E-01 1.2952 E-01 1.4375 E-01 1.5875 E-01 1.5838 E-01 1.5875 E-01 2.0095 E-01 2.1259 E-01 2.213 E-01 2.2211 E-01 2.2211 E-01 2.2259 E-01 2.2259 E-01 2.3258 E-01 2.3258 E-01 2.3258 E-01 2.3258 E-01 2.3258 E-01 2.3258 E-01	1.4939-02 2.2930E-02 3.1265E-02 4.8856E-02 5.8362E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2587E-01 1.7314E-01 1.7314E-01 1.7314E-01 2.2132E-01 2.2132E-01 2.2257E-01 2.2256E-01 2.3927E-01 2.3927E-01 2.3927E-01 2.3927E-01 2.3927E-01 2.39352E-01	6-AL SCÂLAR FLUÍ (30 2.7266E-61 31 2.7764E-01 32 248167E-01 33 2.86860E-01 35 2.86731E-01 36 2.86731E-01 37 2.87782E-01 40 2.7229E-01 41 2.6538E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01 45 2.2210E-01 47 2.1295E-01 48 2.1216E-01 49 2.1367E-01 51 2.225E-01 52 2.3653E-01 53 2.4438E-01 53 2.4498E-01 53 2.4498E-01 54 2.5603E-01 55 2.4498E-01	GROUP-2 479 247784848 247784848 248488240 248481240 248210240 248211240 248211240 248211240 248211240 2482	1980-1980-1980-1980-1980-1980-1980-1980-	## 1010 1	### ### ##############################	-1.9935E-01 1.9418E-01 1.8918E-01 1.8718E-01 1.8718E-01 1.8718E-01 1.8718E-01 1.8788E-01 1.4808E-01 1.4808E-01 1.4808E-01 1.4808E-01 1.4808E-01 1.2863E-01 1.2863E-01 1.2863E-02 8.42282E-02 7.2514E-02 8.4314E-02 3.4668E-02 3.9088E-02 3.1071E-02 2.503E-01
23456789012345678901234567	1.4889 E-02 2.2785E-02 3.1276E-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02 7.9219E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4375E-01 1.4375E-01 1.8751E-01 2.0095E-01 2.1259E-01 2.211E-01 2.2211E-01 2.2211E-01 2.2292E-01 2.2292E-01 2.3258E-01 2.3258E-01 2.34534E-01 2.34534E-01 2.3350E-01	1.4939E-02 2.2980E-02 3.1265E-02 4.8856E-02 6.8459E-02 6.8459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.5840E-01 1.7314E-01 1.7314E-01 2.0100E-01 2.1265E-01 2.2132E-01 2.2132E-01 2.2257E-01 2.2256E-01 2.3927E-01 2.3927E-01 2.3927E-01 2.4636E-01 2.3927E-01 2.5352E-01 2.5352E-01 2.5352E-01 2.5352E-01 2.5352E-01	6-AL SCÄLAR FLUT (30 2.47266E-01 31 2.47764E-01 32 248167E-01 33 2.86860E-01 34 2.8658E-01 35 2.8658E-01 36 2.8663E-01 37 2.8713E-01 38 2.8671E-01 39 2.7703E-01 40 2.7703E-01 41 2.66738E-01 42 2.5719E-01 43 2.4769E-01 44 2.3671E-01 45 2.2210E-01 46 2.1603E-01 47 2.1295E-01 48 2.1216E-01 50 2.1898E-01 51 2.2955E-01 52 2.3653E-01 52 2.3653E-01 53 2.4243E-01 54 2.4699E-01 55 2.55023E-01 55 2.55023E-01 56 2.5715E-01	GROUP 2 479 247784 E + 87 24818 E + 87 24818 E + 87 24818 E + 87 24818 E + 97 24811 E + 97 24811 E + 97 24811 E + 97 24811 E + 97 2478 E + 97 2478 E + 97 2478 E + 97 2418 E +	1501117781107 0 0 12345 0 12345 0 12345 0 12345 0 12345	## 1010 1	### ### ##############################	-1.9938E-01 1.8916E-01 1.8916E-01 1.8919E-01 1.8719E-01 1.8719E-01 1.8719E-01 1.8719E-01 1.8719E-01 1.881E-01 1.881E-01 1.881E-01 1.881E-02
234567890123456789012345679	1.4889 E-02 2.2785 E-02 3.1270 E-02 3.9860 E-02 4.8860 E-02 5.8366 E-02 6.8462 E-02 7.9219 E-01 1.0291 E-01 1.2932 E-01 1.4375 E-01 1.7311 E-01 1.8751 E-01 2.0095 E-01 2.2132 E-01 2.2213 E-01 2.221 E-01 2.2259 E-01 2.3258 E-01 2.3258 E-01 2.3258 E-01 2.3326 E-01 2.335 E-01 2.335 E-01 2.5350 E-01 2.5350 E-01 2.5350 E-01	1.4939-02 2.2930E-02 3.1205E-02 3.9856E-02 4.8856E-02 5.88362E-02 6.88459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.5840E-01 1.7376E-01 1.7376E-01 2.1265E-01 2.1265E-01 2.2132E-01 2.22381E-01 2.22381E-01 2.2366E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01	6-AL SCÂLAR FLUÍ (30 2.7266E-01 31 2.7764E-01 32 248167E-01 33 248468E-01 34 2.8658E-01 35 2.8668E-01 36 2.8668E-01 37 2.8778E-01 38 2.8211E-01 39 2.7708E-01 40 2.7225E-01 41 2.6538E-01 42 2.5719E-01 43 2.4769E-01 44 2.3691E-01 45 2.2210E-01 46 2.1603E-01 47 2.1295E-01 48 2.1367E-01 50 2.1898E-01 51 2.2925E-01 52 2.3693E-01 53 2.4243E-01 53 2.4243E-01 54 2.4699E-01 55 2.5715E-01 56 2.5715E-01 57 2.5776E-01	GROUP-2 6 7 7 1 2 4 7 7 8 4 8 2 4 7 7 8 4 8 2 4 8 1 8 8 2 4 6 1 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 1 8 2 4 8 6 2 4 8 1 8 2 4 8 6 2 4 8 1 8 2 6 1 8 2 4 8 6 2 4 8 1 8 2 6 1 8 2 6 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1	1980-1980-1980-1980-1980-1980-1980-1980-	## 1010 1	### ### ##############################	-1.9935E-01 1.9418E-01 1.8918E-01 1.8718E-01 1.8718E-01 1.8718E-01 1.8718E-01 1.8788E-01 1.4808E-01 1.4808E-01 1.4808E-01 1.4808E-01 1.4808E-01 1.2863E-01 1.2863E-01 1.2863E-02 8.42282E-02 7.2514E-02 8.4314E-02 3.4668E-02 3.9088E-02 3.1071E-02 2.503E-01
23456789012345678901234567	1.4889 E-02 2.2785E-02 3.1276E-02 3.9860E-02 4.8860E-02 5.8366E-02 6.8462E-02 7.9219E-02 1.0291E-01 1.1587E-01 1.2952E-01 1.4375E-01 1.4375E-01 1.8751E-01 2.0095E-01 2.1259E-01 2.211E-01 2.2211E-01 2.2211E-01 2.2292E-01 2.2292E-01 2.3258E-01 2.3258E-01 2.34534E-01 2.34534E-01 2.3350E-01	1.4939-02 2.2930E-02 3.1205E-02 3.9856E-02 4.8856E-02 5.88362E-02 6.88459E-02 7.9217E-02 1.0291E-01 1.1587E-01 1.5840E-01 1.7376E-01 1.7376E-01 2.1265E-01 2.1265E-01 2.2132E-01 2.22381E-01 2.22381E-01 2.2366E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01 2.3266E-01	6-AL SCÄLAR FLUT (30 2.47266E-01 31 2.47764E-01 32 248167E-01 33 2.86860E-01 34 2.8658E-01 35 2.8658E-01 36 2.8663E-01 37 2.8713E-01 38 2.8671E-01 39 2.7703E-01 40 2.7703E-01 41 2.66738E-01 42 2.5719E-01 43 2.4769E-01 44 2.3671E-01 45 2.2210E-01 46 2.1603E-01 47 2.1295E-01 48 2.1216E-01 50 2.1898E-01 51 2.2955E-01 52 2.3653E-01 52 2.3653E-01 53 2.4243E-01 54 2.4699E-01 55 2.55023E-01 55 2.55023E-01 56 2.5715E-01	GROUP 2 479 247784 E + 87 24818 E + 87 24818 E + 87 24818 E + 87 24818 E + 97 24811 E + 97 24811 E + 97 24811 E + 97 24811 E + 97 2478 E + 97 2478 E + 97 2478 E + 97 2418 E +	1501117781107 0 0 12345 0 12345 0 12345 0 12345 0 12345	## 1010 1	### ### ##############################	-1.9938E-01 1.8916E-01 1.8916E-01 1.8919E-01 1.8719E-01 1.8719E-01 1.8719E-01 1.8719E-01 1.8719E-01 1.881E-01 1.881E-01 1.881E-01 1.881E-02



ID.16-A1-

BENCHMARK PROBLEM SCLUTION

Identification: 16-A1-2 Benchmark Problem ID.16-A1

Date Submitted: November 1981 By: W. W. Engle, Jr. (ORNL)

By: R. M. Westfall (ORNL)

Date Accepted: October 1985 C. E. Lee (Consult.)

Descriptive Title: Multigroup Discrete Ordinates Solution with TEA

Mathematical Model: Multigroup energy approximation, discrete ordinates angular approximation, weighted difference spatial and time approximation with automatic coarse mesh rebalance.

Pertinent Features of Technique Used: S4 angular quadrature, suggested 114 interval spatial mesh, 6 delayed neutron groups, and the following time mesh:

Ti	ne	(sec)	<u>del</u>	<u>ta-</u>	t (sec)	L
0	to	10-4	1	х	10-6	
10-4	to	10-1	5	X	10-6	
10 - 1	to	1	5	x	10-5	

Computer: IBM 370/3033

Codes: ANISN , TDA (single precision, 6 decimal digits accuracy)

Date solved: August 1981 at Oak Ridge National Laboratory

References:

- W. W. Engle, Jr. et.al., "One Dimensional Time Dependent Discrete Ordinates," Trans. Am. Nucl. Soc., 12, p 400 (1969)
- E. T. Tomlinson, W. A. Rhoades and W. W. Engle, Jr., "Flux Extrapolation Models Used in the DOT IV Discrete Ordinates Neutron Transport Code," ORNL/TM-7033 (May 1980). (see p.15, The Theta-Weighted Model)
- 3. W. W. Engle, Jr., "A Users Manual for ANISN," K-1693 (March 1967).

- Primary Results: k-eff calculated by ANISN for the initial condition constants of Table I: 1.00000
- Exhibit A: Total power vs. time (relative to an initial total neutron production rate of 1.0) for the reference time step (delta-t) and for two and ten times the reference time step.
- Exhibit B: Plot of total power vs. time for the reference time step size.
- Exhibit C: Average interval scalar flux vs. position at t=0, 0.01, and 1.0 sec.
- Exhibit D: Plot of data in Exhibit C.

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Exhibit A
Power vs. Time

<u>(sec)</u>	<u>power(delta-t)</u>	<u>power(2*delta-t)</u>	power(10*delta-t)
0	1.0		
1 x 10-5	1.0221	1.0209	
2 4 8 1 x 10-4	1.0476		
4	1.0938		
8	1,1737		
	1.2130	1.2055	1.2023
2 4	1.3282		
4	1.4362		
8	1.4929		
1 x 10-3	1.5003	1.5022	1.4948
2 4 8 1 x 10-2	1.5041		
4	1.5055		
8	1.5087		
	1.5089	1.5080	1. 5089
2	1.5120		
4 8	1.5149		
8	1.5192		
1 x 10-1 2 4	1.5215	1.5320	1.5432
2	1.5535		
4	1.6129		
8	1.7195		
1.0	1.7710	1.8170	1.8300
J time (min)	117.2	58.6	12.0

Exhibit B

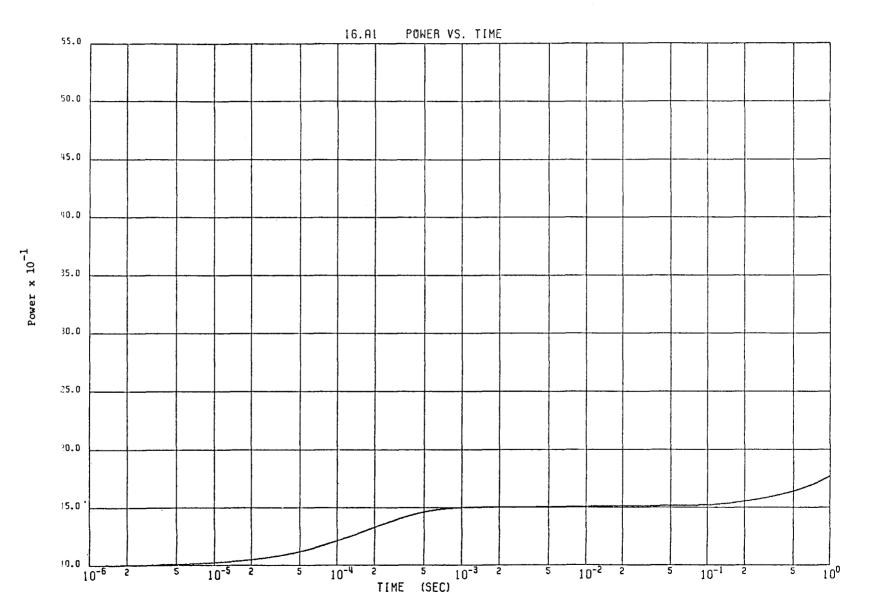


Exhibit C Problem 16-Al Scalar Flux

T=0 SEC.

1 1.37294E-02 5.94370E-03 58 9.22172F0-01 1.36850E-01 2.24807F0-02 9.27847E-03 58 9.22172F0-01 1.36850E-01 3.07236E-02 1.321755-02 60 5.13237E-01 1.34735E-01 5.489082E-02 2.16354E-02 61 5.00066E-01 1.32620E-01 5.92630E-02 2.16354E-02 62 8.82482E-01 1.26261E-01 7.707110E-02 3.09363E-02 62 8.82482E-01 1.26261E-01 7.707110E-02 3.09363E-02 68 8.32639E-01 1.22106E-01 3.34633D-02 3.09627E-02 65 7.30313E-01 1.12106E-01 1.12106E-0	INT.	GEP. 1	GPP. 2	INT.	GRP. 1	GRP. 2
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38 9.25713E-01 1.37293E-01 95 4.69666E-01 1.08266E-01 39 9.14924E-01 1.35432E-01 96 4.09940E-01 1.05782E-01 40 9.00334E-01 1.32985E-01 97 3.53516E-01 1.00812E-01 41 8.81906E-01 1.29950E-01 98 3.07982E-01 9.47580E-02 42 8.59342E-01 1.26307E-01 99 2.63114E-01 8.79878E-02 43 8.31015E-01 1.22132E-01 100 2.33383E-01 8.08942E-02 44 7.89371E-01 1.16727E-01 101 2.02898E-01 7.37348E-02 45 7.51858E-01 1.10045E-01 102 1.76170E-01 6.66913E-02 46 7.34727E-01 1.10045E-01 103 1.52703E-01 5.98845E-02 47 7.29234E-01 1.09411E-01 104 1.32060E-01 5.33877E-02 47 7.34303E-01 1.0941E-01 105 1.13357E-01 4.72404E-02 49 7.51050E-01 1.1914E-01 106 9.77535E-02 4.14557E-02 50 7.89310E-01 1.16603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.229301E-01 109 5.92637E-02 2.16360E-02 53 8.82481E-01 1.29901E-01 110 4.89999E-02 2.16360E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 55 9.13286E-01 1.34735E-01 113 2.24811E-02 9.27871E-03						
39 9.14924E-01 1.35432E-01 96 4.05940E-01 1.05782E-01 40 9.00334E-01 1.32985E-01 97 3.53516E-01 1.00812E-01 41 8.81906E-01 1.29950E-01 98 3.07982E-01 9.47580E-02 42 8.59342E-01 1.26307E-01 99 2.68174E-01 8.79878E-02 43 8.31015E-01 1.22132E-01 100 2.33383E-01 8.08942E-02 44 7.89371E-01 1.16727E-01 101 2.02898E-01 7.37348E-02 45 7.51898E-01 1.10045E-01 102 1.76170E-01 6.66913E-02 46 7.34727E-01 1.0941E-01 104 1.32060E-01 5.98845E-02 47 7.29234E-01 1.0941E-01 104 1.32060E-01 5.33877E-02 43 7.34303E-01 1.09159E-01 105 1.1357E-01 4.72404E-02 49 7.51530E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.22105E-01 108 7.07119E-02 3.60280E-02 51 8.32039E-01 1.26260E+				-		
41 8.81906E-01 1.29050E-01 98 3.07082E-01 9.47580E-02 42 8.59342E-01 1.26307E-01 99 2.68104E-01 8.79878E-02 43 8.31015E-01 1.22132E-01 100 2.33383E-01 8.08942E-02 44 7.89371E-01 1.16727E-01 101 2.02898E-01 7.37348E-02 45 7.51898E-01 1.1009E-01 102 1.76170E-01 6.66913E-02 46 7.34727E-01 1.10045E-01 103 1.52703E-01 5.98845E-02 47 7.29234E-01 1.09411E-01 104 1.32060E-01 5.33877E-02 48 7.34303E-01 1.09411E-01 105 1.13357E-01 4.72404E-02 49 7.51050E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.16603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.61526E-02 53 8.82481E-01 1.29901E-01 110 4.89099E-02 2.16360E-02 54 9.00066E-01 1.32619E-01 111 3.94553E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
42 3.59342E-01 1.26307E-01 99 2.63174E-01 8.79878E-02 43 8.31015E-01 1.22132E-01 100 2.33383E-01 8.08942E-02 44 7.89371E-01 1.16727E-01 101 2.02898E-01 7.37348E-02 45 7.51898E-01 1.10995E-01 102 1.76170E-01 6.66913E-02 46 7.34727E-01 1.10945E-01 103 1.52703E-01 5.98845E-02 47 7.29234E-01 1.09411E-01 104 1.32060E-01 5.3877E-02 43 7.34303E-01 1.29759E-01 105 1.13357E-01 4.72404E-02 49 7.51050E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.16603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.16360E-02 53 8.82481E-01 1.32619E-01 111 3.94558E-02 1.73456E-02 55 9.13286E-01 1.34	4.0	9.003345-01		97	3.53516E-01	
43 8.31015E-01 1.22132E-01 100 2.33383E-01 8.08942E-02 44 7.89371E-01 1.16727E-01 101 2.02898E-01 7.37348E-02 45 7.51858E-01 1.12090E-01 102 1.76170E-01 6.66913E-02 46 7.34727E-01 1.10045E-01 103 1.52703E-01 5.98845E-02 47 7.29234E-01 1.0941E-01 104 1.32060E-01 5.33877E-02 43 7.34303E-01 1.0941E-01 105 1.13357E-01 4.72404E-02 49 7.51030E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.16603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.29301E-01 110 4.89999E-02 2.16360E-02 53 8.82481E-01 1.32619E-01 111 3.94553E-02 1.73456E-02 54 9.0006E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 55 9.13286E-01 1.361						
44 7.89371E-01 1.16727E-01 101 2.02898E-01 7.37348E-02 45 7.51898E-01 1.12090E-01 102 1.76170E-01 6.66913E-02 46 7.34727E-01 1.10045E-01 103 1.52703E-01 5.98845E-02 47 7.29234E-01 1.09411E-01 104 1.32060E-01 5.33877E-02 43 7.34303E-01 1.09505E-01 105 1.13357E-01 4.72404E-02 49 7.51030E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.2603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.16360E-02 53 8.82481E-01 1.29301E-01 110 4.89939E-02 2.16360E-02 54 9.006E-01 1.32619E-01 111 3.94553E-02 1.73456E-02 55 9.1326E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 55 9.22127E-01 1.3614						
45 7.51898E-01 1.12090E-01 102 1.76170E-01 6.66913E-02 46 7.34727E-01 1.10045E-01 103 1.52703E-01 5.98845E-02 47 7.29234E-01 1.09411E-01 104 1.32060E-01 5.38877E-02 48 7.34303E-01 1.0959E-01 105 1.13377E-01 4.72404E-02 49 7.51530E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.16603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.61526E-02 53 8.82481E-01 1.29301E-01 110 4.89939E-02 2.16360E-02 54 9.0066E-01 1.32619E-01 111 3.94553E-02 1.73456E-02 55 9.13266E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
46 7.34727E-01 1.10045E-01 103 1.52703E-01 5.98845E-02 47 7.29234E-01 1.09411E-01 104 1.32060E-01 5.33877E-02 43 7.34303E-01 1.09059E-01 105 1.13357E-01 4.72404E-02 49 7.51630E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.16603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.61526E-02 53 8.82481E-01 1.29301E-01 110 4.89939E-02 2.16360E-02 54 9.0006E-01 1.32619E-01 111 3.94558E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
47 7.29234E-01 1.09411E-01 104 1.32060E-01 5.33877E-02 43 7.34303E-01 1.09059E-01 105 1.13357E-01 4.72404E-02 49 7.51030E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.2603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.61526E-02 53 8.82481E-01 1.29301E-01 110 4.89939E-02 2.16360E-02 54 9.00066E-01 1.32619E-01 111 3.94553E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
49 7.51050E-01 1.11914E-01 106 9.77535E-02 4.14557E-02 50 7.89319E-01 1.16603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.61526E-02 53 8.82481E-01 1.29301E-01 110 4.89999E-02 2.16360E-02 54 9.0006E-01 1.32619E-01 111 3.94553E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03				104	1.32060E-01	5.33877E-02
50 7.89319E-01 1.16603E-01 107 8.34649E-02 3.60280E-02 51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.61526E-02 53 8.82481E-01 1.29301E-01 110 4.89989E-02 2.16360E-02 54 9.00066E-01 1.32619E-01 111 3.94558E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03	43	7.34303E-01				
51 8.32039E-01 1.22105E-01 108 7.07119E-02 3.09371E-02 52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.61526E-02 53 8.82481E-01 1.29301E-01 110 4.89989E-02 2.16360E-02 54 9.00066E-01 1.32619E-01 111 3.94558E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
52 8.60310E-01 1.26260E-01 109 5.92637E-02 2.61526E-02 53 8.82481E-01 1.29801E-01 110 4.89989E-02 2.16360E-02 54 9.0006E-01 1.32619E-01 111 3.94558E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
53 8.82481E-01 1.29901E-01 110 4.89909E-02 2.16360E-02 54 9.0006E-01 1.32619E-01 111 3.94558E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
54 9.00066E-01 1.32619E-01 111 3.94558E-02 1.73456E-02 55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
55 9.13286E-01 1.34735E-01 112 3.07240E-02 1.32179E-02 56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
56 9.22127E-01 1.36144E-01 113 2.24811E-02 9.27871E-03						
57 9.26557E-01 1.36850E-01 114 1.37296E-02 5.04387E-03	56	9.221278-01	1.36144E-01	113	2.24811E-02	
	57	9.26557E-01	1.36850E-01	114	1.37296E-02	5.04387E-03

Exhibit C (Con't) PROBLEM 16-A1 SCALAR PLUX

T=0.01 SEC. T=1.0 SEC.

INT.	GRP. 1 2.293980-02	GP7. 2	INT.	GR2. 1	GS7. 2	INT:	GRP. 1	Gnn. 2	INT.	GPP. 1	GRP. 2
2	3.756207-02	8.427905-03	58	1.38374E 00	2.04445E-01	1	2.692238-02	9.89110E-03	58	1.62237E 00	2.397058-01
ź	5.13347E-02	1.550428-02	59	1.36978E 00	2.02316E-01	2	4.408323-02	1.919578-02	59	1.605938 00	2.37200E-01
,	6.59242E-02	2.209655-02	60	1.34930E 00	1.991452-01	3	6.024695-02	2.59307E-02	60	1.53185E 00	2.334728-01
7		2.899382-02	61	1.32238E 00	1.94938E-01	4	7.73693E-02	3.40154E-02	61	1.55021E 00	2.285298-01
5	8.17195E-02	3.615302+02	62	1.23907E 00	1.69703E-01	Ş	9.570678-02	4.243908-02	62	1.511093 00	2.223428-01
ť	9.90216E-02	4.370052-02	63	1.24911E 00	1.834202-01	Ė	1.162135-01	5.13866R-02	6.3	1.46417E OC	2.150368-01
7	1.131512-01	5.169558-02	64	1.20037E 00	1.76248E-01	7	1.386635-01	6.066948-02	64	1.406993 00	2.065888-01
8	1.394615-01	6.020283-02	65	1.13106E 00	1.671518-01	8	1.636738-01	7.06531E-02	65	1. 32566% 00	1.959152-01
9	1.633465-01	€.9?731E-02	66	1.07050E 00	1.59570E-01	9	1.91705E-01	8-129782-02	66	1.254638 00	1.970218-01
10	1.90248E-01	7.394022-02	67	1.04313E 00	1.562460-01	10	2.232775-01	9.26431E-02	67	1.22248B 00	1.83120E-01
11	2.20665E-01	8.921393-02	68	1.032298 00	1.54928E-01	11	2.589741-01	1.047012-01	68	1. 209788 00	1.815702-01
12	2.55162C-01	1.000725-01	69	1.036453 00	1.55283E-01	12	2.99459E-01	1.17444E-01	69	1. 2146 1E 00	1.81982E-01
13	2.94379E-01	1.114503-01	70	1.057028 00	1.57626E-01	13	3.45484E-01	1.307978-01	70	1.238693 00	1.84722E-01
14	3.390442-01	1.232232-01	71	1.102735 00	1.63146E-01	14	3.97902E-01	1.446138-01	71	1. 29220E OC	1.91184E-01
15	3.899890-01	1.35191E-01	72	1.15185E 00	1.69363E-01	15	4.576911-01	1.58659F-01	72	1. 34969E OC	1.98460E-01
16	4.48165E-01	1.470502-01	73	1.18336E 00	1.73958E-01	16	5.25966E-01	1.72576E-01	73	1. 386553 00	2.039368-01
17	5.145592-01	1.593600-01	74	1.277168 00	1.77879E-01	17	6.040025-01	1.85861F-01	74	1.414388 00	2.084225-01
13	5.90757E-01	1.68492E-01	75	1.225652 0)	1.81054E-01	18	6.93309E-01	1.9774 1E-01	75		
19	6.783692-01	1.763058-01	76	1.233398 00	1.83503E-01					1.435998 00	2.121J4E-01
20	7.84 663E-01	1.309665-01	77	1.248465 00		19	7.96125E-01	2.074965-01	76	1.45204E 00	2.149965-01
21	8.94131E-01	1.913C8E-01	78		1.85240E-01	20	9.2111CE-01	2.12380E-01	77	1.462628 00	2.170248-01
22	9.87227E-01		79	1.25288E 00	1.86279E-01	21	1.049412 00	2.127828-01	78	1.467755 00	2.18235E-01
23	1.070198 00	1.82976E-61		1.252622 00	1.86637E-01	22	1.15860E 00	2.14739E-01	79	1.46740E 00	2.186498-01
		1.871112-01	80	1.24768E 00	1.863332-01	23	1.255968 00	2.19591r-01	BO	1. 461578 OC	2.182878-01
24	1. 14667E 00	1.321102-01	81	1.238075 03	1.85393E-01	24	1.34571E 00	2.25456F-01	8 1	1.45028E 00	2.171815-01
25	1.21722E 00	1.07636E-01	82	1.223812 00	1.83845E-01	25	1.428512 00	2.319988-01	8.2	1.433542 OC	2.15363E-01
26	1-281815 00	2.03472E-01	83	1.204953 00	1.81726E-01	26	1.5043CE 00	2.387872-01	83	1.411428 OC	2.128768-01
27	1-340253 00	2.091948-01	84	1.131558 00	1.79080E-01	27	1.57288E 00	2.4550CE-01	84	1.383988 00	2.097738-01
2 4	1.392375 00	2.14633E-01	8.5	1.15367E 00	1.75962E-01	28	1.63403E 00	2.51980F-01	8.5	1. 35130E OC	2.061165-01
29	1.43707E 00	2.136123-01	86	1.12140E 00	1.72438E-01	25	1.68753E 00	2.57721E-01	86	1.31349E 00	2.01985E-01
30	1.47690E 00	2.239922-01	87	1.08484E 00	1.68588E-01	30	1.73320E 00	2.62857E-01	87	1. 270645 00	1.97473E-01
31	1.50902E 00	2.276605-01	88	1.04407E 00	1.645135-01	3 1	1.77086E 00	2,67158E-01	8.8	1. 222998 00	1.926965-01
32	1.53419E 00	2.305278-01	6.8	9.99258E-01	1.603323-01	32	1.80038E 00	2.70519E-01	89	1. 17037E OC	1.877978-01
33	1.55234E 00	2.325242-01	90	9.50455E-01	1.56195E-01	33	1.82164E 00	2.72858E-01	90	1. 11319E 00	1.829495-01
34	1.5633 4E 00	2.33595E-01	91	€.97760E-01	1.52282E-01	34	1.83458E 00	2.74110F-01	91	1.05147E 00	1.78364E-01
35	1.567312 00	2.336985-01	92	E.41133E-01	1.48824E-01	35	1.83914E 00	2.742256-01	92	9.85141E-01	1.74312E-01
36	1.564J9E 00	2.328012-01	93	7.30040E-01	1-46023E-01	36	1.83532E 00	2.73167E-01	93	9.13584E-01	1.71030g-01
37	1.553758 00	2.338823-01	94	7.119678-01	1.44999E-01	37	1.82314E 00	2.70908E-01	94	8.33853E-01	1.69830E-01
38	1.53635E 00	2.27922E-01	95	6-28052E-01	1.44738E-01	38	1.802688 00	2.674288-01	95		
39	1.51197E 00	2.23911E-01	96	5.42835E-01	1.414622-01	39	1.77403E 00	2.62715E-01		7.355748-01	1.695828-01
43	1.48072E 00	2.138428-01	97	4-727298-01	1.348142-01	40	1.7373CE 00	2.56760E-01	96	6.35768E-01	1.655862-01
41	1.44253E 00	2.12711E-01	9.8	4.11836E-01	1.26716E-01	41	1.692558 00		97	5.53660g-01	1.578998-01
42	1.39735E G3	2.054912-01	99	3.58628D-01	1.17661E-01	42	1.63937£ 00	2.49559E-01	98	4.92342R-01	1.484148-01
43	1.34247E 00	1.973382-01	100	3.12077E-01	1.08173E-01	43		2.41080E-01	99	4. 20024E-01	1.378078-01
4.4	1.26519E 00	1.37104E-01	101	2.713112-01	9.85981E-02	44	1.574918 00	2.31505E-01	100	3.65503E-01	1.266952-01
45	1.19763E 00	1.785696-01	102	2.35569E-01			1.484192 00	2.19491P-01	101	3. 17759E-01	1.154902-01
45	1.16650E 00	1.747432-01	103		8.917862-02	45	1.40488E 00	2.09471E-01	102	2.75898E-01	1.04448E-01
47	1.15394E 00	1.73 1628-01		2.041838-01	8.007562-02	46	1.36834E 00	2.04978E-01	103	2.39144R-01	9.378565-02
			104	1.76584E-01	7.13879E-02	47	1.35357E 00	2.03118E-01	104	2.068148-01	8.361015-02
48	1.158105 00	1.734518-01	105	1.52243E-01	6.31673E-02	48	1.35842E 00	2.03452E-01	105	1.783066-01	7.39822E-02
49	1.180612 00	1.759578-01	106	1.307168-01	5.54323E-02	49	1.3847EE 00	2.063978-01	106	1.53094E-01	6.492268-02
50	1.234445 00	1.82386E-01	107	1.116332-01	4.817443-02	50	1.447862 00	2.139198-01	107	1.30708E-01	5.642229-02
51	1.292638 07	1.397205-01	108	9-454978-02	4. 13670E-02	51	1.51609g 00	2.22510E-01	108	1.107368-01	4.844935-02
52	1.32826E 00	1.949493-01	109	7-924195-02	3.49694R-02	52	1.557758 00	2.28633E-01	109	9.280745-02	4.095652-02
53	1.35440E 00	1.092335-01	110	£.53960E-02	2.89299E-02	.53	1.58833E 00	2.33646E-01	110	7.65913E-02	3.38930E-02
54	1.373522 00	2.024096-01	111	5.275622-02	2-31931E-02	5.4	1.61067E 00	2.373598-01	111	6. 17876E-02	2.7 1640E-02
55	1.386005 00	2.045138-01	112	4.10809E-02	1.76739E-02	<u> </u>	1.625242 00	2.39917E-01	112	4.811365-02	2.06998E-02
56	1-39187E 07	2.055498-01	113	3.00593E-02	1.24067E-02	56	1.63205E 00	2.410218-01	113	J. 52052E-02	1.45308E-02
57	1.39111E 00	2.055243-01	114	1.83577E-02	6.74419E-03	57	1.63109E 00	2.40982E-01	114	2.15004E-02	7.898878-03

Exhibit D

