1 SUMMARY

Computes values of the complete elliptic integrals of the 1st and 2nd kind, viz.

\[ K(m) = \int_0^\frac{\pi}{2} (1 - m^2 \sin^2 \theta)^{\frac{1}{2}} d\theta \quad 0 \leq m^2 < 1 \]

\[ E(m) = \int_0^\frac{\pi}{2} (1 - m^2 \sin^2 \theta)^{\frac{1}{2}} d\theta \quad 0 \leq m^2 < 1 \]

The subroutine uses an approximation of the form

\[ \sum_{k=0}^{n} (1 - m^2)^k \left\{ b_k \log\left( \frac{1}{1 - m^2} \right) \right\} \]

see for \( n = 4 \) C.R. Hastings, ‘Approximations for digital computers’.


2 HOW TO USE THE PACKAGE

The single precision version

CALL FB01A(EMSQ,OPT,VK,VE)

The double precision version

CALL FB01AD(EMSQ,OPT,VK,VE)

EMSQ is a REAL (DOUBLE PRECISION in the D version) variable which must be set by the user to the floating point value of \( m^2 \). Restriction: \( 0 \leq m^2 < 1 \).

OPT is a REAL (DOUBLE PRECISION in the D version) variable which must be set by the user to control which integral is required. The possible values are

1. to evaluate only \( K(m) \).
2. to evaluate only \( E(m) \).
3. to evaluate both integrals.

VK is a REAL (DOUBLE PRECISION in the D version) variable which is set by the subroutine to the value of \( K(m) \). It is only set if selected by the argument OPT.

VE is a REAL (DOUBLE PRECISION in the D version) variable which is set by the subroutine to the value of \( E(m) \). It is only set if selected by the argument OPT.
3 GENERAL INFORMATION

Use of common: none.
Workspace: none.
Other routines: calls FD05.
Input/Output: none.
Restrictions:
0 ≤ m² < 1,
OPT can only take values 1, 2 or 3.
Accuracies:
6 figures using 4-byte arithmetic
14 figures using 8-byte arithmetic