

4 . Fortran Codes

This chapter presents the callable routines developed in the course of the research on the integrals of Chapter 3. Executable programs are found in driver files denoted by BECKDRVR.FOR, AMOSDRVR.FOR or RESEARCH.FOR. The main library containing supporting subroutines is formed from AMOSSUBS.FOR+BECKSUBS.FOR. The driver program and the main library must be compiled and linked to form an executable unit.

The files listed below are stored as text files on a disk which is attached at the end of this handbook.

Disk Contents

Callable Subroutines and Functions in File AMOSSUBS.FOR

	CALLABLE SUBROUTINE :	FOLDER
Q	DGAUS8 (FUN, A, B, ERR, ANS, IERR)	SLATEC
$Q = \sum Q_{k_i}$	DQUAD8 (DQFUN, INIT, X1, SIG, REL, X2, QANS, IERR)	21
$E_{N+k}(x)$	DEXINT (X, N, KODE, M, TOL, EN, NZ, IERR)	SLATEC
$E_{1/2+k}(x)$	DHEXINT (X, FNH, KODE, M, TOL, EN, NZ, IERR)	18
$G_{N+k}(x)$	DGEXINT (X, N, KODE, M, TOL, GN, EN, NZ, IERR)	18
$G_{1/2+k}(x)$	DGHEXINT (X, FNH, KODE, M, TOL, GN, EN, NZ, IERR)	18
$ierfc(x)$	DIERFC (X, KODE, ANS, IERR)	10, 16
$i^{N_0+k}erfc(x)$	DINERFC (X, N0, KODE, N, REL, Y, NZ)	SLATEC
$\frac{(-1)^{k+1}}{k!}\psi^{(k)}(x)$	DPSIFN (X, N, KODE, M, ANS, NZ, IERR)	SLATEC
	XERROR (MESS, NMESS, NERR, LEVEL)	SLATEC
	XERRWV (MESSG, NMESSG, NERR, LEVEL, NI, I1, I2, NR, R1, R2)	SLATEC
	FDUMP	SLATEC
	CALLABLE FUNCTION :	FOLDER
$erf(x), erfc(x)$	DOUBLE PRECISION FUNCTION DRERF (X, KODE, NZ)	AMOSLIB
$F(x)$	DOUBLE PRECISION FUNCTION DFERF (X, REL, IERR)	16
$G(x)$	DOUBLE PRECISION FUNCTION DGERFC (X, KODE, REL, IERR)	16
$H_{23}(x)$	DOUBLE PRECISION FUNCTION DHERFC (X)	23
$\psi(N)$	DOUBLE PRECISION FUNCTION DPSIXN (N)	SLATEC
$\ln \Gamma(z)$	DOUBLE PRECISION FUNCTION DGAMLN (Z, IERR)	SLATEC
	DOUBLE PRECISION FUNCTION D1MACH (I)	SLATEC
	INTEGER FUNCTION I1MACH (I)	SLATEC
	REAL FUNCTION R1MACH (I)	SLATEC

Callable Subroutines and Functions in File BECKSUBS.FOR

CALLABLE SUBROUTINE:	FOLDER
INTEGI1 (A,B,T,KODE,REL,ANSI1,IERR)	1,2,10
INTEGI2 (A,B,T,KODE,ANSI2,IERR)	9
INTEGI9 (A,B,T,KODE,ANSI9,IERR)	9
INTEGI3 (A,B,C,T,ANSI3,IERR,KFORM)	7
INTEGI5 (A,B,X,ANSI5,IERR)	5
INTEGJ5 (A,B,X,ANSJ5,IERR)	5
INTEGV5 (A,B,X,ANSV5,IERR)	5
INTEGI6 (A,B,T,KODE,ANSI6,IERR)	3,6,15
INTEGP (A,B,T,KODE,REL,PANS,IERR)	11
INTEGQ (A,B,T,REL,QANS,IERR)	11
INTEGW3 (A,B,T,KODE,REL,ANSW3,IERR)	10
INTEGI21 (A,B,C,T,KODE,ANSI21,I21ERR,KFORM)	21
INTEGJ21 (A,B,C,T,ANSJ21,J21ERR,KFORM)	21
INTEGI22 (A,B,C,T,ANSI22,I22ERR,KFORM)	22
INTEGJ22 (A,B,C,T,ANSJ22,J22ERR,KFORM)	22
INTEGI29 (A,B,T,N0,NN,YN,IERR)	29
INTEGS1 (A,B,C,T,TOL,S1,IERR,KFORM)	21
INTEGS2 (A,B,C,T,TOL,S2,IERR,KFORM)	22
GNSEQ (A,B,CAPT,M,REL,YN)	21
CALLABLE FUNCTION:	FOLDER
DVOFT (A,B,T,REL,IERR,KFORM)	21
PHIZ (Z)	5

Executable Programs in File BECKDRVR.FOR

PROGRAM:	OUTPUT:	FOLDER
PROGRAM I1COMP	I1COMP.TXT	1,2,10
PROGRAM I2COMP	I2COMP.TXT	9
PROGRAM I9COMP	I9COMP.TXT	9
PROGRAM I3COMP	I3COMP.TXT	7
PROGRAM I5COMP	I5COMP.TXT	5
PROGRAM J5COMP	J5COMP.TXT	5
PROGRAM V5COMP	V5COMP.TXT	5
PROGRAM I6COMP	I6COMP.TXT	3,6,15
PROGRAM W3COMP	W3COMP.TXT	10
PROGRAM PCOMP	PCOMP.TXT	11
PROGRAM QCOMP	QCOMP.TXT	11
PROGRAM I21COMP	I21COMP.TXT	21
PROGRAM J21COMP	J21COMP.TXT	21
PROGRAM I22COMP	I22COMP.TXT	22
PROGRAM J22COMP	J22COMP.TXT	22
PROGRAM I29COMP	I29COMP.TXT	29
PROGRAM GNCOMP	GNCOMP.TXT	21
PROGRAM VTCOMP	VTCOMP.TXT	21

Executable Programs in File AMOSDRVR.FOR

PROGRAM :	OUTPUT :	FOLDER
PROGRAM GECOMP	GECOMP.TXT	18
PROGRAM GHECOMP	GHECOMP.TXT	18
PROGRAM DFCOMP	DFCOMP.TXT	16
PROGRAM DGCOMP	DGCOMP.TXT	16
PROGRAM HERFCOMP	HERFCOMP.TXT	23

Executable Programs in File RESEARCH.FOR

PROGRAM :	OUTPUT :	FOLDER
PROGRAM I1COMPB	I1COMPB.TXT	1, 2
PROGRAM I4COMP	I4COMP.TXT	8
PROGRAM J4COMP	J4COMP.TXT	8
PROGRAM ERFINT	ERFINT.TXT	12
PROGRAM I13COMP	I13COMP.TXT	13
PROGRAM I14COMP	I14COMP.TXT	14
PROGRAM I19COMP	I19COMP.TXT	19
PROGRAM I20COMP	I20COMP.TXT	20
PROGRAM I24COMP	I24COMP.TXT	24
PROGRAM J24COMP	J24COMP.TXT	24
PROGRAM V24COMP	V24COMP.TXT	24
PROGRAM I25COMP	I25COMP.TXT	25
PROGRAM I26COMP	I26COMP.TXT	26
PROGRAM I26ACOMP	I26ACOMP.TXT	26
PROGRAM DGSCOMP	DGSCOMP.TXT	16

FILE DESCRIPTIONS

The following files contain the programs and subroutines which were used to check out formulas numerically.

BECKSUBS.FOR is a file of subroutines and functions which implement many of the formulae in developed in Chapter 3. These can be regarded as “complete”, which means that these codes were constructed with high accuracy over large ranges of variables in mind and contain parameters which record input and output errors when some condition is violated.

AMOSSUBS.FOR is a file which contains codes published in ACM Collected Algorithms or the SLATEC library, codes copied from a personal archive called AMOSLIB, or codes developed as natural extensions of those in the SLATEC Library or AMOSLIB. High accuracy is the dominant consideration in the development of these codes.

BECKDRVR.FOR is a file of drivers (PROGRAM...) which exercise the subroutines of BECKSUBS.FOR, and, when successfully completed, show typical relative errors when compared with an alternate method of computation. For integrals, this alternate method is usually a direct quadrature with DGAUS8 or DQUAD8.

AMOSDRVR.FOR is a file of driver routines which exercise not previously published subroutines in AMOSSUBS.FOR in the manner of BECKDRVR.FOR.

RESEARCH.FOR is a file containing codes which implement a formula or procedure but does not contain error checking nor flags for unusual occurrences. A code with this designation is *not* to be considered “complete” or algorithmic (where accurate values over stated ranges of variables are returned).

USAGE: To execute a driver program, it must be extracted from BECKDRVR.FOR, AMOSDRVR.FOR, or RESEARCH.FOR, compiled and linked to the compiled files AMOSSUBS.FOR and BECKSUBS.FOR. Each of these files starts with a code consisting of all comment lines with text which describes the contents of the file. These information subroutines are labeled BPRGINFO, APRGINFO, RPRGINFO, AMOSINFO, and BECKINFO, respectively.

MACHINE DEPENDANT CONSTANTS: The FORTRAN code distributed with this document contains machine dependant functions

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INTEGER FUNCTION I1MACH(I), I=1,16
REAL FUNCTION R1MACH(I), I=1,5
DOUBLE PRECISION FUNCTION D1MACH(I), I=1,5
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which define important machine constants (File AMOSSUBS.FOR). Some of the codes which were adapted from the SLATEC library require these functions in order to compute properly. These functions have FORTRAN code which returns machine constants for a variety of machines. These are set in comment statements. To define a machine, simply remove the C in column 1 and re-comment any active FORTRAN code from a previous setting. The default settings define the IBM PC which will work for many other personal computers. The prologue of each function defines the value returned for each I. To see the numeric values which will define your machine, simply evaluate each function in a loop and print out the values.