

NAG Library Routine Document

C06GCF

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of *bold italicised* terms and other implementation-dependent details.

1 Purpose

C06GCF forms the complex conjugate of a sequence of n data values.

2 Specification

```
SUBROUTINE C06GCF (Y, N, IFAIL)
```

```
INTEGER          N, IFAIL
```

```
REAL (KIND=nag_wp) Y(N)
```

3 Description

This is a utility routine for use in conjunction with C06ECF or C06FCF to calculate inverse discrete Fourier transforms (see the C06 Chapter Introduction).

4 References

None.

5 Parameters

1: Y(N) – REAL (KIND=nag_wp) array *Input/Output*

On entry: if Y is declared with bounds (0 : N – 1) in the subroutine from which C06GCF is called, then Y(j) must contain the imaginary part of the j th data value, for $0 \leq j \leq n - 1$.

On exit: these values are negated.

2: N – INTEGER *Input*

On entry: n , the number of data values.

Constraint: $N \geq 1$.

3: IFAIL – INTEGER *Input/Output*

On entry: IFAIL must be set to 0, –1 or 1. If you are unfamiliar with this parameter you should refer to Section 3.3 in the Essential Introduction for details.

For environments where it might be inappropriate to halt program execution when an error is detected, the value –1 or 1 is recommended. If the output of error messages is undesirable, then the value 1 is recommended. Otherwise, if you are not familiar with this parameter, the recommended value is 0. **When the value –1 or 1 is used it is essential to test the value of IFAIL on exit.**

On exit: IFAIL = 0 unless the routine detects an error or a warning has been flagged (see Section 6).

6 Error Indicators and Warnings

If on entry $IFAIL = 0$ or -1 , explanatory error messages are output on the current error message unit (as defined by X04AAF).

Errors or warnings detected by the routine:

$IFAIL = 1$

On entry, $N < 1$.

7 Accuracy

Exact.

8 Further Comments

The time taken by C06GCF is negligible.

9 Example

This example reads in a sequence of complex data values and prints their inverse discrete Fourier transform as computed by calling C06GCF, followed by C06ECF and C06GCF again.

9.1 Program Text

```

Program c06gcfe

!      C06GCF Example Program Text

!      Mark 24 Release. NAG Copyright 2012.

!      .. Use Statements ..
Use nag_library, Only: c06ecf, c06gcf, nag_wp
!      .. Implicit None Statement ..
Implicit None
!      .. Parameters ..
Integer, Parameter      :: nin = 5, nout = 6
!      .. Local Scalars ..
Integer                  :: ieof, ifail, j, n
!      .. Local Arrays ..
Real (Kind=nag_wp), Allocatable :: x(:), y(:)
!      .. Executable Statements ..
Write (nout,*) 'C06GCF Example Program Results'
!      Skip heading in data file
Read (nin,*)

loop: Do
  Read (nin,*,Iostat=ieof) n
  If (ieof<0) Exit loop

  Allocate (x(0:n-1),y(0:n-1))
  Read (nin,*)(x(j),y(j),j=0,n-1)

!      ifail: behaviour on error exit
!      =0 for hard exit, =1 for quiet-soft, =-1 for noisy-soft
  ifail = 0
  Call c06gcf(y,n,ifail)

  Call c06ecf(x,y,n,ifail)
  Call c06gcf(y,n,ifail)

  Write (nout,*)
  Write (nout,*) 'Components of inverse discrete Fourier transform'
  Write (nout,*)
  Write (nout,*) '          Real          Imag'
  Write (nout,*)

```

```
      Write (nout,99999)(j,x(j),y(j),j=0,n-1)
      Deallocate (x,y)
End Do loop

99999 Format (1X,I6,2F10.5)
End Program c06gcfe
```

9.2 Program Data

```
C06GCF Example Program Data
  7           : n
  0.34907   -0.37168
  0.54890   -0.35669
  0.74776   -0.31175
  0.94459   -0.23702
  1.13850   -0.13274
  1.32850    0.00074
  1.51370    0.16298      : x, y
```

9.3 Program Results

C06GCF Example Program Results

Components of inverse discrete Fourier transform

	Real	Imag
0	2.48361	-0.47100
1	0.01983	-0.56496
2	-0.14825	-0.30840
3	-0.22506	-0.17477
4	-0.28767	-0.05865
5	-0.36711	0.09756
6	-0.55180	0.49684
