NAG Toolbox

nag_sum_conjugate_hermitian_mult_rfmt (c06gq)

1   Purpose

nag_sum_conjugate_hermitian_mult_rfmt (c06gq) forms the complex conjugates of m Hermitian sequences, each containing n data values.

Note: This function is scheduled to be withdrawn, please see c06gq in Advice on Replacement Calls for Withdrawn/Superseded Routines..

2   Syntax

```
[x, ifail] = nag_sum_conjugate_hermitian_mult_rfmt(m, n, x)
```

```
[x, ifail] = c06gq(m, n, x)
```

3   Description

This is a utility function for use in conjunction with nag_sum_fft_real_1d_multi_rfmt (c06fp) and nag_sum_fft_hermitian_1d_multi_rfmt (c06fq) to calculate inverse discrete Fourier transforms (see the C06 Chapter Introduction).

4   References

None.

5   Parameters

5.1   Compulsory Input Parameters

1:    **m** – INTEGER

m, the number of Hermitian sequences to be conjugated.

Constraint: $\mathbf{m} \geq 1$.

2:    **n** – INTEGER

n, the number of data values in each Hermitian sequence.

Constraint: $\mathbf{n} \geq 1$.

3:    $\mathbf{x}(\mathbf{m} \times \mathbf{n})$ – REAL (KIND=nag_wp) array

The data must be stored in **x** as if in a two-dimensional array of dimension $(1 : \mathbf{m}, 0 : \mathbf{n} - 1)$; each of the m sequences is stored in a **row** of the array in Hermitian form. If the n data values z_j^p are written as $x_j^p + i y_j^p$, then for $0 \leq j \leq n/2$, x_j^p is contained in $\mathbf{x}(p, j)$, and for $1 \leq j \leq (n-1)/2$, y_j^p is contained in $\mathbf{x}(p, n - j)$. (See also Section 2.1.2 in the C06 Chapter Introduction.)

5.2   Optional Input Parameters

None.

5.3 Output Parameters

1:    $\mathbf{x}(\mathbf{m} \times \mathbf{n})$ – REAL (KIND=nag_wp) array

The imaginary parts y_j^p are negated. The real parts x_j^p are not referenced.

2:    **ifail** – INTEGER

ifail $= 0$ unless the function detects an error (see Section 5).

6   Error Indicators and Warnings

Errors or warnings detected by the function:

ifail $= 1$

On entry, $\mathbf{m} < 1$.

ifail $= 2$

On entry, $\mathbf{n} < 1$.

ifail $= -99$

An unexpected error has been triggered by this routine. Please contact NAG.

ifail $= -399$

Your licence key may have expired or may not have been installed correctly.

ifail $= -999$

Dynamic memory allocation failed.

7   Accuracy

Exact.

8   Further Comments

None.

9   Example

This example reads in sequences of real data values which are assumed to be Hermitian sequences of complex data stored in Hermitian form. The sequences are expanded into full complex form using nag_sum_convert_herm2complex_sep (c06gs) and printed. The sequences are then conjugated (using nag_sum_conjugate_hermitian_mult_rfmt (c06gq)) and the conjugated sequences are expanded into complex form using nag_sum_convert_herm2complex_sep (c06gs) and printed out.

9.1 Program Text

```
    function c06gq_example

fprintf('c06gq example results\n\n');

% 3 Hermitian sequences stored as rows in compact form
m = nag_int(3);
n = nag_int(6);
x = [0.3854  0.6772  0.1138  0.6751  0.6362  0.1424;
     0.5417  0.2983  0.1181  0.7255  0.8638  0.8723;
     0.9172  0.0644  0.6037  0.6430  0.0428  0.4815];
```

```
disp('Original values in compact Hermitian form:');
disp(x);

% Put x in full complex form
[u, v, ifail] = c06gs(m, n, x);

nd = [m,n];
z = reshape(u + i*v,nd);
disp(' ');
title = 'Original data in full complex form';
[ifail] = x04da('General','Non-unit', z, title);

% Conjugate values
[xc, ifail] = c06gq(m, n, x);
disp(' ');
disp('Conjugated data in compact Hermitian form:');
disp(xc);

[u, v, ifail] = c06gs(m, n, xc);
zc = reshape(u + i*v,nd);
disp(' ');
title = 'Conjugated data in full complex form';
[ifail] = x04da('General','Non-unit', zc, title);
```

9.2   Program Results

```
    c06gq example results

Original values in compact Hermitian form:
    0.3854    0.6772    0.1138    0.6751    0.6362    0.1424
    0.5417    0.2983    0.1181    0.7255    0.8638    0.8723
    0.9172    0.0644    0.6037    0.6430    0.0428    0.4815


 Original data in full complex form
          1       2       3       4       5       6
 1   0.3854  0.6772  0.1138  0.6751  0.1138  0.6772
     0.0000  0.1424  0.6362  0.0000 -0.6362 -0.1424

 2   0.5417  0.2983  0.1181  0.7255  0.1181  0.2983
     0.0000  0.8723  0.8638  0.0000 -0.8638 -0.8723

 3   0.9172  0.0644  0.6037  0.6430  0.6037  0.0644
     0.0000  0.4815  0.0428  0.0000 -0.0428 -0.4815

Conjugated data in compact Hermitian form:
    0.3854    0.6772    0.1138    0.6751   -0.6362   -0.1424
    0.5417    0.2983    0.1181    0.7255   -0.8638   -0.8723
    0.9172    0.0644    0.6037    0.6430   -0.0428   -0.4815


 Conjugated data in full complex form
          1       2       3       4       5       6
 1   0.3854  0.6772  0.1138  0.6751  0.1138  0.6772
     0.0000 -0.1424 -0.6362  0.0000  0.6362  0.1424

 2   0.5417  0.2983  0.1181  0.7255  0.1181  0.2983
     0.0000 -0.8723 -0.8638  0.0000  0.8638  0.8723

 3   0.9172  0.0644  0.6037  0.6430  0.6037  0.0644
     0.0000 -0.4815 -0.0428  0.0000  0.0428  0.4815
```