

NAG Toolbox

nag_sum_conjugate_hermitian_rfmt (c06gb)

1 Purpose

nag_sum_conjugate_hermitian_rfmt (c06gb) forms the complex conjugate of a Hermitian sequence of n data values.

Note: This function is scheduled to be withdrawn, please see c06gb in Advice on Replacement Calls for Withdrawn/Superseded Routines..

2 Syntax

```
[x, ifail] = nag_sum_conjugate_hermitian_rfmt(x, 'n', n)
[x, ifail] = c06gb(x, 'n', n)
```

3 Description

This is a utility function for use in conjunction with nag_sum_fft_real_1d_nowork (c06ea), nag_sum_fft_hermitian_1d_nowork (c06eb), nag_sum_fft_real_1d_rfmt (c06fa) or nag_sum_fft_hermitian_1d_rfmt (c06fb) to calculate inverse discrete Fourier transforms (see the C06 Chapter Introduction).

4 References

None.

5 Parameters

5.1 Compulsory Input Parameters

1: **x(n)** – REAL (KIND=nag_wp) array

If the data values z_j are written as $x_j + iy_j$ and if **x** is declared with bounds $(0 : \mathbf{n} - 1)$ in the function from which nag_sum_conjugate_hermitian_rfmt (c06gb) is called, then for $0 \leq j \leq n/2$, **x(j)** must contain x_j ($= x_{n-j}$), while for $n/2 < j \leq n - 1$, **x(j)** must contain $-y_j$ ($= y_{n-j}$). In other words, **x** must contain the Hermitian sequence in Hermitian form. (See also Section 2.1.2 in the C06 Chapter Introduction.)

5.2 Optional Input Parameters

1: **n** – INTEGER

Default: the dimension of the array **x**.

n , the number of data values.

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

5.3 Output Parameters

1: **x(n)** – REAL (KIND=nag_wp) array

The imaginary parts y_j are negated. The real parts x_j 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, **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

The time taken by nag_sum_conjugate_hermitian_rfmt (c06gb) is negligible.

9 Example

This example reads in a sequence of real data values, calls nag_sum_fft_real_1d_nowork (c06ea) followed by nag_sum_conjugate_hermitian_rfmt (c06gb) to compute their inverse discrete Fourier transform, and prints this after expanding it from Hermitian form into a full complex sequence.

9.1 Program Text

```
function c06gb_example

fprintf('c06gb example results\n\n');

% real data
n = 7;
x = [0.34907 0.54890 0.74776 0.94459 1.13850 1.32850 1.51370];

% transform
[xt, ifail] = c06ea(x);

% get result in form useful for printing.
zt = nag_herm2complex(xt);
disp('Discrete Fourier Transform of x:');
disp(transpose(zt));

% restore by conjugating and backtransforming
[xt, ifail] = c06gb(xt);
[xr, ifail] = c06eb(xt);

fprintf('Original sequence as restored by inverse transform\n\n');
fprintf('      Original    Restored\n');
for j = 1:n
    fprintf('%3d    %7.4f    %7.4f\n',j, x(j),xr(j));
```

```

end

function [z] = nag_herm2complex(x);
n = size(x,2);
z(1) = complex(x(1));
for j = 2:floor((n-1)/2) + 1
    z(j) = x(j) + i*x(n-j+2);
    z(n-j+2) = x(j) - i*x(n-j+2);
end
if (mod(n,2)==0)
    z(n/2+1) = complex(x(n/2+1));
end

```

9.2 Program Results

c06gb example results

Discrete Fourier Transform of x:

2.4836	+ 0.0000i
-0.2660	+ 0.5309i
-0.2577	+ 0.2030i
-0.2564	+ 0.0581i
-0.2564	- 0.0581i
-0.2577	- 0.2030i
-0.2660	- 0.5309i

Original sequence as restored by inverse transform

	Original	Restored
1	0.3491	0.3491
2	0.5489	0.5489
3	0.7478	0.7478
4	0.9446	0.9446
5	1.1385	1.1385
6	1.3285	1.3285
7	1.5137	1.5137
