1 SUMMARY

To compute the **value of a polynomial** $P(x)$ of degree n which is **expressed as** a linear combination of **orthogonal polynomials** $Q_k(x)$ k=0, 1,..., n, i.e.

$$P(x) = c_0 Q_0(x) + c_1 Q_1(x) + ... + c_n Q_n(x)$$

where the polynomials $Q_k(x)$ are defined by the recurrence relation

$$Q_0(x) = 1,$$

$$Q_1(x) = x - \alpha_0,$$

$$Q_{k+1}(x) = (x - \alpha_k)Q_k(x) - \beta_k Q_{k-1}(x) \qquad k\text{=1, 2,..., n-1 .}$$

See F.J. Smith, 'Maths. of Computation', Jan. 1965.

ATTRIBUTES — Version: 1.0.0. **Remark:** Can be used to compute values of polynomial fits obtained by `VC01A`. **Types:** `PE07A`; `PE07AD`. **Original date:** July 1964. **Origin:** S.Northcliffe, Harwell.

2 HOW TO USE THE PACKAGE

2.1 The argument list and calling sequence

The single precision version

```
REAL PE07A,P
   -     -
P=PE07A(N,ALPHA,BETA,C,X)
```

The double precision version

```
DOUBLE PRECISION PE07AD,P
     -         -
P=PE07AD(N,ALPHA,BETA,C,X)
```

N is an `INTEGER` variable which must be set by the user to n the degree of the polynomial.

ALPHA is a `REAL` (`DOUBLE PRECISION` in the D version) array which must be set by the user to the recurrence relation parameters α_i, i.e. set `ALPHA(i+1)` to α_i, i=0, 1, 2,..., $n-1$.

BETA is a `REAL` (`DOUBLE PRECISION` in the D version) array which must be set by the user to the recurrence relation parameters β_i, i.e. set `BETA(i+1)` to β_i, i=1, 2,..., $n-1$. Note that `BETA(1)` need not be set.

C is a `REAL` (`DOUBLE PRECISION` in the D version) array which must be set by the user to the coefficients c_i in the orthogonal polynomial expansion given in the summary, i.e. set `C(i+1)` to c_i, i=0, 1, 2,..., n.

X is a `REAL` (`DOUBLE PRECISION` in the D version) variable which must be set by the user to the value of x for which the polynomial value is required.

Note that `PE07` is a Fortran function subroutine and its proper type must be declared to obtain the full precision as shown at the beginning of this section.

3 GENERAL INFORMATION

Workspace: None.

Use of common: None.

Other routines called directly: None.

Input/output: None.

Restrictions: None.