Partial eigenvalues problem
Coordinate relaxation
KZ

A - initial matrix

x0 - initial estimate of the eigenvector

k - the number of iterations

ϵ - the accuracy with which the eigenvalue is searched

λ - eigenvalue

m - the i-th coordinate of the eigenvector in which the change occurs (in this case, the cyclic selection of the coordinate)

```
coordRelax[A_, x0_, k_, ϵ_] :=
 Module[{x = x0, f1, a, m, p, q, λ, iter, λ1 = 1, e = IdentityMatrix[Length@A]},
  p = A.x.x;
  q = x.x;
  f1 = A.x;
  Do[λ = A.x.x / x.x;
   If[Abs[λ1 - λ] < ϵ, Break[]];
   m = If[Mod[i, Length@A] == 0, m = Length@A, m = Mod[i, Length@A]];
   a = Max@
     Flatten@Values@Solve[v^2 (f1[[m]] - A[[m, m]]) + v (p - q A[[m, m]]) + p x[[m]] - q f1[[m]] == 0, v];
   x = x + a * e[[m]];
   p = A.x.x;
   q = x.x;
   f1 = A.x;
   λ1 = λ;
   iter = i, {i, k}];
  {x / Sqrt[Total[#^2 & /@ x]], λ1, iter}]
```

Test 1

```
A = {{1, .42, .54, .66}, {.42, 1, .32, .44}, {.54, .32, 1, .22}, {.66, .44, .22, 1}};
x = {1, 1, 1, 1};
```

```
coordRelax[A, x, 7, 0.0001]
```

```
{{0.579612, 0.460693, 0.430055, 0.516588}, 2.32269, 5}
```

```
Eigenvectors[A][[1]]
```

```
{-0.579643, -0.459997, -0.433459, -0.514326}
```

```
Max@Eigenvalues[A]
```

```
2.32275
```

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Test 2

```
B = {{.1, .2, .3}, {.2, .4, .5}, {.3, .5, .8}};
x1 = {1, 1, 1};
```

```
coordRelax[B, x1, 8, 0.001] // N
```

```
{{0.295562, 0.534485, 0.791814}, 1.251, 5.}
```

```
Max@Eigenvalues@B // N
```

```
1.25142
```

```
Eigenvectors[B][[1]] // N
```

```
{0.298826, 0.534477, 0.790593}
```