Programa complet

```mathematica
Clear["Global`*"];

SetDirectory["esciviu ací el directori de treball"];

(* Definim els caràcters de C∞ᵠ de les
 irreps D₀ fins a D₅₀ (dlim=50) en notació complexa*)
dlim = 50;
caracter[0] = 1; R₀ = caracter[0];
For[i = 1/2, i ≤ dlim, i += 1/2,

  caracter[i] = ∑_{m=-i}^{i} Exp[I m φ];

  Rᵢ = caracter[i];

 ];
(* Triem el moment angular*)
<< input1.txt
xx = R_{j0};

(*rep és el caràcter de la representació reductible *)
(*********** S2 *************)
rep2 = 1/2 (Expand[xx²] + Expand[(xx /. φ → 2 φ)]) // Expand;

a1 = ExpToTrig[Expand[rep2]];

rep12 = 1/2 (Expand[xx²] - Expand[(xx /. φ → 2 φ)]) // Expand;

a2 = ExpToTrig[Expand[rep12]];
S2 = {a1, a2}; S2Sym = {"[2]", "[1²]"}; S2dim = {1, 1};
(*********** S3 *************)
rep3 = 1/6 (Expand[xx³] + 3 Expand[xx /. φ → 2 φ] xx + 2 Expand[xx /. φ → 3 φ]);

a1 = ExpToTrig[Expand[rep3]];

rep21 = 2/3 (Expand[xx³] - Expand[xx /. φ → 3 φ]);  e = ExpToTrig[Expand[rep21]];

rep13 = 1/6 (Expand[xx³] - 3 Expand[xx /. φ → 2 φ] xx + 2 Expand[xx /. φ → 3 φ]);

a2 = ExpToTrig[Expand[rep13]];
S3 = {a1, e, a2}; S3Sym = {"[3]", "[2 1]", "[1³]"};  S3dim = {1, 2, 1};
(*********** S4 *************)
rep4 = 1/24 (Expand[xx⁴] + 8 Expand[xx /. φ → 3 φ] xx + 3 Expand[(xx /. φ → 2 φ)²] +
    6 Expand[xx /. φ → 4 φ] + 6 Expand[Expand[xx²] * Expand[xx /. φ → 2 φ]]) //
  Expand; a1 = ExpToTrig[Expand[rep4]];
rep31 = 3/24 (3 Expand[xx⁴] - 3 Expand[(xx /. φ → 2 φ)²] -
    6 Expand[xx /. φ → 4 φ] + 6 Expand[Expand[xx²] * Expand[xx /. φ → 2 φ]]) //
  Expand;   f2 = ExpToTrig[Expand[rep31]];
rep22 = 2/24 (2 Expand[xx⁴] - 8 Expand[xx /. φ → 3 φ] xx + 6 Expand[(xx /. φ → 2 φ)²]) //
  Expand;    e = ExpToTrig[Expand[rep22]];
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```mathematica
rep212 = 3/24 (3 Expand[xx⁴] - 3 Expand[(xx /. φ → 2 φ)²] +
      6 Expand[xx /. φ → 4 φ] - 6 Expand[Expand[xx²] * Expand[xx /. φ → 2 φ]]) //
   Expand;   f1 = ExpToTrig[Expand[rep212]];
rep14 = 1/24 (Expand[xx⁴] + 8 Expand[xx /. φ → 3 φ] xx + 3 Expand[(xx /. φ → 2 φ)²] -
      6 Expand[xx /. φ → 4 φ] - 6 Expand[Expand[xx²] * Expand[xx /. φ → 2 φ]]) //
   Expand;   a2 = ExpToTrig[Expand[rep14]];



S4 = {a1, f2, e, f1, a2};
S4Sym = {"[4]", "[3 1]", "[2²]", "[2 1²]", "[1⁴]"};   S4dim = {1, 3, 2, 3, 1};
(********** S5 *************)
rep5 = 1/120 (Expand[xx⁵] + 15 Expand[(xx /. φ → 2 φ)²] xx +
      30 Expand[(xx /. φ → 4 φ)] xx + 20 Expand[xx²] Expand[xx /. φ → 3 φ] +
      24 Expand[xx /. φ → 5 φ] + 20 Expand[(xx /. φ → 2 φ)] Expand[(xx /. φ → 3 φ)] +
      10 Expand[(xx /. φ → 2 φ)] Expand[xx³]) // Expand;  a1 = ExpToTrig[Expand[rep5]];
rep41 = 4/120 (4 Expand[xx⁵] + 20 Expand[xx²] Expand[xx /. φ → 3 φ] -
      24 Expand[xx /. φ → 5 φ] - 20 Expand[(xx /. φ → 2 φ)] Expand[(xx /. φ → 3 φ)] +
      20 Expand[(xx /. φ → 2 φ)] Expand[xx³]) // Expand;  g1 = ExpToTrig[Expand[rep41]];
rep32 = 5/120 (5 Expand[xx⁵] + 15 Expand[(xx /. φ → 2 φ)²] xx -
      30 Expand[(xx /. φ → 4 φ)] xx - 20 Expand[xx²] Expand[xx /. φ → 3 φ] +
      20 Expand[(xx /. φ → 2 φ)] Expand[(xx /. φ → 3 φ)] +
      10 Expand[(xx /. φ → 2 φ)] Expand[xx³]) // Expand; h1 = ExpToTrig[Expand[rep32]];
rep312 = 6/120 (6 Expand[xx⁵] - 30 Expand[(xx /. φ → 2 φ)²] xx + 24 Expand[xx /. φ → 5 φ]) //
   Expand;  j = ExpToTrig[Expand[rep312]];
rep221 = 5/120 (5 Expand[xx⁵] + 15 Expand[(xx /. φ → 2 φ)²] xx +
      30 Expand[(xx /. φ → 4 φ)] xx - 20 Expand[xx²] Expand[xx /. φ → 3 φ] -
      20 Expand[(xx /. φ → 2 φ)] Expand[(xx /. φ → 3 φ)] -
      10 Expand[(xx /. φ → 2 φ)] Expand[xx³]) // Expand; h2 = ExpToTrig[Expand[rep221]];
rep213 = 4/120 (4 Expand[xx⁵] + 20 Expand[xx²] Expand[xx /. φ → 3 φ] -
      24 Expand[xx /. φ → 5 φ] + 20 Expand[(xx /. φ → 2 φ)] Expand[(xx /. φ → 3 φ)] -
      20 Expand[(xx /. φ → 2 φ)] Expand[xx³]) // Expand;  g2 = ExpToTrig[Expand[rep213]];
rep15 = 1/120 (Expand[xx⁵] + 15 Expand[(xx /. φ → 2 φ)²] xx - 30 Expand[(xx /. φ → 4 φ)] xx +
      20 Expand[xx²] Expand[xx /. φ → 3 φ] + 24 Expand[xx /. φ → 5 φ] -
      20 Expand[(xx /. φ → 2 φ)] Expand[(xx /. φ → 3 φ)] -
      10 Expand[(xx /. φ → 2 φ)] Expand[xx³]) // Expand;  a2 = ExpToTrig[Expand[rep15]];
S5 = {a1, g1, h1, j, h2, g2, a2};  S5Sym = {"[5]", "[4 1]", "[3 2]", "[3 1²]",
   "[2² 1]", "[2 1³]", "[1⁵]"};  S5dim = {1, 4, 5, 6, 5, 4, 1};
(********** S6 *************)
rep6 =
   1/720 (xx⁶ + 15 xx⁴ Expand[(xx /. φ → 2 φ)] + 40 xx³ (xx /. φ → 3 φ) + 90 xx² (xx /. φ → 4 φ) +
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      45 xx² (xx /. φ → 2 φ)² + 120 xx (xx /. φ → 2 φ) (xx /. φ → 3 φ) + 144 xx (xx /. φ → 5 φ) +
      120 (xx /. φ → 6 φ) + 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + 15 (xx /. φ → 2 φ)³ +
      40 (xx /. φ → 3 φ)²) // Expand; a6 = ExpToTrig[Expand[rep6]];

         5
rep51 = ─── (5 xx⁶ + 3 × 15 xx⁴ Expand[(xx /. φ → 2 φ)] + 2 × 40 xx³ (xx /. φ → 3 φ) +
        720
      1 × 90 xx² (xx /. φ → 4 φ) + 1 × 45 xx² (xx /. φ → 2 φ)² +
      0 × 120 xx (xx /. φ → 2 φ) (xx /. φ → 3 φ) + 0 × 144 xx (xx /. φ → 5 φ) +
      (-1) 120 (xx /. φ → 6 φ) + (-1) 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) +
      (-1) 15 (xx /. φ → 2 φ)³ + (-1) 40 (xx /. φ → 3 φ)²) //
   Expand; a51 = ExpToTrig[Expand[rep51]];

         9
rep42 = ─── (9 xx⁶ + 3 × 15 xx⁴ Expand[(xx /. φ → 2 φ)] + 0 × 40 xx³ (xx /. φ → 3 φ) +
        720
      (-1) 90 xx² (xx /. φ → 4 φ) + 1 × 45 xx² (xx /. φ → 2 φ)² + 0 × 120 xx (xx /. φ → 2 φ)
       (xx /. φ → 3 φ) + (-1) 144 xx (xx /. φ → 5 φ) + 0 × 120 (xx /. φ → 6 φ) +
      1 × 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + 3 × 15 (xx /. φ → 2 φ)³ + 0 × 40 (xx /. φ → 3 φ)²) //
   Expand; a42 = ExpToTrig[Expand[rep42]];

          10
rep412 = ─── (10 xx⁶ + 2 × 15 xx⁴ Expand[(xx /. φ → 2 φ)] + 1 × 40 xx³ (xx /. φ → 3 φ) +
         720
      0 × 90 xx² (xx /. φ → 4 φ) + (-2) 45 xx² (xx /. φ → 2 φ)² + (-1) 120 xx (xx /. φ → 2 φ)
       (xx /. φ → 3 φ) + 0 × 144 xx (xx /. φ → 5 φ) + 1 × 120 (xx /. φ → 6 φ) +
      0 × 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + (-2) 15 (xx /. φ → 2 φ)³ + 1 × 40 (xx /. φ → 3 φ)²) //
   Expand; a412 = ExpToTrig[Expand[rep412]];

         5
rep32 = ─── (5 xx⁶ + 1 × 15 xx⁴ Expand[(xx /. φ → 2 φ)] + (-1) 40 xx³ (xx /. φ → 3 φ) +
        720
      (-1) 90 xx² (xx /. φ → 4 φ) + 1 × 45 xx² (xx /. φ → 2 φ)² +
      1 120 xx (xx /. φ → 2 φ) (xx /. φ → 3 φ) + 0 × 144 xx (xx /. φ → 5 φ) +
      0 × 120 (xx /. φ → 6 φ) + (-1) 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + (-3) 15 (xx /. φ → 2 φ)³ +
      2 × 40 (xx /. φ → 3 φ)²) // Expand; a32 = ExpToTrig[Expand[rep32]];

          16
rep321 = ─── (16 xx⁶ + 0 × 15 xx⁴ Expand[(xx /. φ → 2 φ)] + (-2) 40 xx³ (xx /. φ → 3 φ) +
         720
      0 × 90 xx² (xx /. φ → 4 φ) + 0 × 45 xx² (xx /. φ → 2 φ)² + 0 120 xx (xx /. φ → 2 φ)
       (xx /. φ → 3 φ) + 1 × 144 xx (xx /. φ → 5 φ) + 0 × 120 (xx /. φ → 6 φ) +
      0 × 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + 0 15 (xx /. φ → 2 φ)³ + (-2) 40 (xx /. φ → 3 φ)²) //
   Expand; a321 = ExpToTrig[Expand[rep321]];

         5
rep23 = ─── (5 xx⁶ + (-1) 15 xx⁴ Expand[(xx /. φ → 2 φ)] + (-1) 40 xx³ (xx /. φ → 3 φ) +
        720
      1 × 90 xx² (xx /. φ → 4 φ) + 1 × 45 xx² (xx /. φ → 2 φ)² + (-1) 120 xx (xx /. φ → 2 φ)
       (xx /. φ → 3 φ) + 0 × 144 xx (xx /. φ → 5 φ) + 0 × 120 (xx /. φ → 6 φ) +
      (-1) 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + 3 × 15 (xx /. φ → 2 φ)³ + 2 × 40 (xx /. φ → 3 φ)²) //
   Expand; a23 = ExpToTrig[Expand[rep23]];

          10
rep313 = ─── (10 xx⁶ + (-2) 15 xx⁴ Expand[(xx /. φ → 2 φ)] + 1 × 40 xx³ (xx /. φ → 3 φ) +
         720
      0 × 90 xx² (xx /. φ → 4 φ) + (-2) 45 xx² (xx /. φ → 2 φ)² + 1 × 120 xx (xx /. φ → 2 φ)
       (xx /. φ → 3 φ) + 0 × 144 xx (xx /. φ → 5 φ) + (-1) 120 (xx /. φ → 6 φ) +
      0 × 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + 2 × 15 (xx /. φ → 2 φ)³ + 1 × 40 (xx /. φ → 3 φ)²) //
   Expand; a313 = ExpToTrig[Expand[rep313]];

           9
rep2212 = ─── (9 xx⁶ + (-3) 15 xx⁴ Expand[(xx /. φ → 2 φ)] + 0 × 40 xx³ (xx /. φ → 3 φ) +
          720
      1 × 90 xx² (xx /. φ → 4 φ) + 1 × 45 xx² (xx /. φ → 2 φ)² + 0 × 120 xx (xx /. φ → 2 φ)
       (xx /. φ → 3 φ) + (-1) 144 xx (xx /. φ → 5 φ) + 0 × 120 (xx /. φ → 6 φ) +
      1 × 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + (-3) 15 (xx /. φ → 2 φ)³ + 0 × 40 (xx /. φ → 3 φ)²) //
   Expand; a2212 = ExpToTrig[Expand[rep2212]];
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rep214 = 5/720 (5 xx^6 + (-3) 15 xx^4 Expand[(xx /. φ → 2 φ)] +
    2 × 40 xx^3 (xx /. φ → 3 φ) + (-1) 90 xx^2 (xx /. φ → 4 φ) + 1 × 45 xx^2 (xx /. φ → 2 φ)^2 +
    0 × 120 xx (xx /. φ → 2 φ) (xx /. φ → 3 φ) + 0 × 144 xx (xx /. φ → 5 φ) +
    1 × 120 (xx /. φ → 6 φ) + (-1) 90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) +
    1 × 15 (xx /. φ → 2 φ)^3 + (-1) 40 (xx /. φ → 3 φ)^2) //
   Expand; a214 = ExpToTrig[Expand[rep214]];
rep16 = 1/720 (xx^6 + (-1) 15 xx^4 Expand[(xx /. φ → 2 φ)] + 40 xx^3 (xx /. φ → 3 φ) +
    (-1) 90 xx^2 (xx /. φ → 4 φ) + 45 xx^2 (xx /. φ → 2 φ)^2 + (-1) 120 xx (xx /. φ → 2 φ)
      (xx /. φ → 3 φ) + 144 xx (xx /. φ → 5 φ) + (-1) 120 (xx /. φ → 6 φ) +
    90 (xx /. φ → 2 φ) (xx /. φ → 4 φ) + (-1) 15 (xx /. φ → 2 φ)^3 + 40 (xx /. φ → 3 φ)^2) //
   Expand; a16 = ExpToTrig[Expand[rep16]];
S6 = {a6, a51, a42, a412, a32, a321, a23, a313, a2212, a214, a16};
S6Sym = {"[6]", "[5 1]", "[4 2]", "[4 1^2]", "[3^2]", "[3 2 1]", "[2^3]", "[3 1^3]",
   "[2^2 1^2]", "[2 1^4]", "[1^6]"}; S6dim = {1, 5, 9, 10, 5, 16, 5, 10, 9, 5, 1};
(********** S7 *************)
rep7 =
  1/5040 (xx^7 + 21 xx^5 Expand[(xx /. φ → 2 φ)] + 70 xx^4 (xx /. φ → 3 φ) + 210 xx^3 (xx /. φ → 4 φ) +
     105 xx^3 (xx /. φ → 2 φ)^2 + 420 xx^2 (xx /. φ → 2 φ) (xx /. φ → 3 φ) +
     504 xx^2 (xx /. φ → 5 φ) + 840 xx (xx /. φ → 6 φ) + 630 xx (xx /. φ → 2 φ) (xx /. φ → 4 φ) +
     105 xx (xx /. φ → 2 φ)^3 + 280 xx (xx /. φ → 3 φ)^2 + 504 (xx /. φ → 2 φ) (xx /. φ → 5 φ) +
     210 (xx /. φ → 2 φ)^2 (xx /. φ → 3 φ) + 420 (xx /. φ → 3 φ) (xx /. φ → 4 φ) +
     720 (xx /. φ → 7 φ)) // Expand; a7 = ExpToTrig[Expand[rep7]];
rep61 = 6/5040 (6 xx^7 + 4 × 21 xx^5 Expand[(xx /. φ → 2 φ)] + 3 × 70 xx^4 (xx /. φ → 3 φ) +
    2 × 210 xx^3 (xx /. φ → 4 φ) + 2 × 105 xx^3 (xx /. φ → 2 φ)^2 +
    1 × 420 xx^2 (xx /. φ → 2 φ) (xx /. φ → 3 φ) + 1 × 504 xx^2 (xx /. φ → 5 φ) +
    0 × 840 xx (xx /. φ → 6 φ) + 0 × 630 xx (xx /. φ → 2 φ) (xx /. φ → 4 φ) +
    0 × 105 xx (xx /. φ → 2 φ)^3 + 0 × 280 xx (xx /. φ → 3 φ)^2 +
    (-1) 504 (xx /. φ → 2 φ) (xx /. φ → 5 φ) + (-1) 210 (xx /. φ → 2 φ)^2 (xx /. φ → 3 φ) +
    (-1) 420 (xx /. φ → 3 φ) (xx /. φ → 4 φ) + (-1) 720 (xx /. φ → 7 φ)) //
   Expand; a61 = ExpToTrig[Expand[rep61]];
rep52 = 14/5040 (14 xx^7 + 6 × 21 xx^5 Expand[(xx /. φ → 2 φ)] + 2 × 70 xx^4 (xx /. φ → 3 φ) +
    0 × 210 xx^3 (xx /. φ → 4 φ) + 2 × 105 xx^3 (xx /. φ → 2 φ)^2 +
    0 × 420 xx^2 (xx /. φ → 2 φ) (xx /. φ → 3 φ) + (-1) 504 xx^2 (xx /. φ → 5 φ) +
    (-1) 840 xx (xx /. φ → 6 φ) + 0 × 630 xx (xx /. φ → 2 φ) (xx /. φ → 4 φ) +
    2 × 105 xx (xx /. φ → 2 φ)^3 + (-1) 280 xx (xx /. φ → 3 φ)^2 +
    1 × 504 (xx /. φ → 2 φ) (xx /. φ → 5 φ) + 2 × 210 (xx /. φ → 2 φ)^2 (xx /. φ → 3 φ) +
    0 × 420 (xx /. φ → 3 φ) (xx /. φ → 4 φ) + 0 × 720 (xx /. φ → 7 φ)) //
   Expand; a52 = ExpToTrig[Expand[rep52]];
rep512 = 15/5040 (15 xx^7 + 5 × 21 xx^5 Expand[(xx /. φ → 2 φ)] + 3 × 70 xx^4 (xx /. φ → 3 φ) +
    1 × 210 xx^3 (xx /. φ → 4 φ) + (-1) 105 xx^3 (xx /. φ → 2 φ)^2 +
    (-1) 420 xx^2 (xx /. φ → 2 φ) (xx /. φ → 3 φ) + 0 × 504 xx^2 (xx /. φ → 5 φ) +
    0 840 xx (xx /. φ → 6 φ) + (-1) 630 xx (xx /. φ → 2 φ) (xx /. φ → 4 φ) +
    (-3) 105 xx (xx /. φ → 2 φ)^3 + 0 × 280 xx (xx /. φ → 3 φ)^2 +
    0 × 504 (xx /. φ → 2 φ) (xx /. φ → 5 φ) + (-1) 210 (xx /. φ → 2 φ)^2 (xx /. φ → 3 φ) +
    1 × 420 (xx /. φ → 3 φ) (xx /. φ → 4 φ) + 1 × 720 (xx /. φ → 7 φ)) //
   Expand; a512 = ExpToTrig[Expand[rep512]];
```

$$\text{rep43} = \frac{14}{5040} \left(14\, xx^7 + 4 \times 21\, xx^5\, \text{Expand}[(xx\, /.\, \phi \to 2\,\phi)] + (-1)\, 70\, xx^4\, (xx\, /.\, \phi \to\, 3\,\phi) + \right.$$

$$(-2)\; 210\, xx^3\, (xx\, /.\, \phi \to 4\,\phi) + 2 \times 105\, xx^3\, (xx\, /.\, \phi \to 2\,\phi)^2 +$$

$$1 \times 420\, xx^2\, (xx\, /.\, \phi \to\, 2\,\phi)\, (xx\, /.\, \phi \to 3\,\phi) + (-1)\; 504\, xx^2\, (xx\, /.\, \phi \to\, 5\,\phi) +$$

$$0\; 840\, xx\, (xx\, /.\, \phi \to\, 6\,\phi) + 0 \times 630\, xx\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) +$$

$$0 \times 105\, xx\, (xx\, /.\, \phi \to 2\,\phi)^3 + 2 \times 280\, xx\, (xx\, /.\, \phi \to 3\,\phi)^2 +$$

$$(-1)\; 504\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 5\,\phi) + (-1)\; 210\, (xx\, /.\, \phi \to 2\,\phi)^2\, (xx\, /.\, \phi \to 3\,\phi) +$$

$$\left. 1 \times 420\; (xx\, /.\, \phi \to 3\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) + 0 \times 720\, (xx\, /.\, \phi \to 7\,\phi)\right)\ //$$

   `Expand; a43 = ExpToTrig[Expand[rep43]];`

$$\text{rep421} = \frac{35}{5040} \left(35\, xx^7 + 5 \times 21\, xx^5\, \text{Expand}[(xx\, /.\, \phi \to 2\,\phi)] + (-1)\, 70\, xx^4\, (xx\, /.\, \phi \to\, 3\,\phi) + \right.$$

$$(-1)\; 210\, xx^3\, (xx\, /.\, \phi \to 4\,\phi) + (-1)\, 105\, xx^3\, (xx\, /.\, \phi \to 2\,\phi)^2 +$$

$$(-1)\; 420\, xx^2\, (xx\, /.\, \phi \to\, 2\,\phi)\, (xx\, /.\, \phi \to 3\,\phi) + 0\; 504\, xx^2\, (xx\, /.\, \phi \to\, 5\,\phi) +$$

$$1\; 840\, xx\, (xx\, /.\, \phi \to\, 6\,\phi) + 1 \times 630\, xx\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) +$$

$$1 \times 105\, xx\, (xx\, /.\, \phi \to 2\,\phi)^3 + (-1)\; 280\, xx\, (xx\, /.\, \phi \to 3\,\phi)^2 +$$

$$0\; 504\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 5\,\phi) + (-1)\; 210\, (xx\, /.\, \phi \to 2\,\phi)^2\, (xx\, /.\, \phi \to 3\,\phi) +$$

$$\left. (-1)\; 420\; (xx\, /.\, \phi \to 3\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) + 0 \times 720\, (xx\, /.\, \phi \to 7\,\phi)\right)\ //$$

   `Expand; a421 = ExpToTrig[Expand[rep421]];`

$$\text{rep321b} = \frac{21}{5040} \left(21\, xx^7 + 1 \times 21\, xx^5\, \text{Expand}[(xx\, /.\, \phi \to 2\,\phi)] + (-3)\, 70\, xx^4\, (xx\, /.\, \phi \to\, 3\,\phi) + \right.$$

$$(-1)\; 210\, xx^3\, (xx\, /.\, \phi \to 4\,\phi) + 1 \times 105\, xx^3\, (xx\, /.\, \phi \to 2\,\phi)^2 +$$

$$1 \times 420\, xx^2\, (xx\, /.\, \phi \to\, 2\,\phi)\, (xx\, /.\, \phi \to 3\,\phi) + 1\; 504\, xx^2\, (xx\, /.\, \phi \to\, 5\,\phi) +$$

$$0\; 840\, xx\, (xx\, /.\, \phi \to\, 6\,\phi) + (-1)\, 630\, xx\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) +$$

$$(-3)\; 105\, xx\, (xx\, /.\, \phi \to 2\,\phi)^3 + 0\; 280\, xx\, (xx\, /.\, \phi \to 3\,\phi)^2 +$$

$$1\; 504\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 5\,\phi) + 1 \times 210\, (xx\, /.\, \phi \to 2\,\phi)^2\, (xx\, /.\, \phi \to 3\,\phi) +$$

$$\left. (-1)\; 420\; (xx\, /.\, \phi \to 3\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) + 0 \times 720\, (xx\, /.\, \phi \to 7\,\phi)\right)\ //$$

   `Expand; a321b = ExpToTrig[Expand[rep321b]];`

$$\text{rep413} = \frac{20}{5040} \left(20\, xx^7 + 0 \times 21\, xx^5\, \text{Expand}[(xx\, /.\, \phi \to 2\,\phi)] + 2 \times 70\, xx^4\, (xx\, /.\, \phi \to\, 3\,\phi) + \right.$$

$$0\; 210\, xx^3\, (xx\, /.\, \phi \to 4\,\phi) + (-4)\, 105\, xx^3\, (xx\, /.\, \phi \to 2\,\phi)^2 +$$

$$0 \times 420\, xx^2\, (xx\, /.\, \phi \to\, 2\,\phi)\, (xx\, /.\, \phi \to 3\,\phi) + 0\; 504\, xx^2\, (xx\, /.\, \phi \to\, 5\,\phi) +$$

$$0\; 840\, xx\, (xx\, /.\, \phi \to\, 6\,\phi) + 0 \times 630\, xx\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) +$$

$$0 \times 105\, xx\, (xx\, /.\, \phi \to 2\,\phi)^3 + 2\; 280\, xx\, (xx\, /.\, \phi \to 3\,\phi)^2 +$$

$$0\; 504\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 5\,\phi) + 2 \times 210\, (xx\, /.\, \phi \to 2\,\phi)^2\, (xx\, /.\, \phi \to 3\,\phi) +$$

$$\left. 0\; 420\; (xx\, /.\, \phi \to 3\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) + (-1)\, 720\, (xx\, /.\, \phi \to 7\,\phi)\right)\ //$$

   `Expand; a413 = ExpToTrig[Expand[rep413]];`

$$\text{rep322} = \frac{21}{5040} \left(21\, xx^7 + (-1)\; 21\, xx^5\, \text{Expand}[(xx\, /.\, \phi \to 2\,\phi)] + \right.$$

$$(-3)\, 70\, xx^4\, (xx\, /.\, \phi \to\, 3\,\phi) + 1\; 210\, xx^3\, (xx\, /.\, \phi \to 4\,\phi) + 1 \times 105\, xx^3\, (xx\, /.\, \phi \to 2\,\phi)^2 +$$

$$(-1)\; 420\, xx^2\, (xx\, /.\, \phi \to\, 2\,\phi)\, (xx\, /.\, \phi \to 3\,\phi) + 1\; 504\, xx^2\, (xx\, /.\, \phi \to\, 5\,\phi) +$$

$$0\; 840\, xx\, (xx\, /.\, \phi \to\, 6\,\phi) + (-1)\, 630\, xx\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) +$$

$$3 \times 105\, xx\, (xx\, /.\, \phi \to 2\,\phi)^3 + 0\; 280\, xx\, (xx\, /.\, \phi \to 3\,\phi)^2 +$$

$$(-1)\; 504\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 5\,\phi) + 1 \times 210\, (xx\, /.\, \phi \to 2\,\phi)^2\, (xx\, /.\, \phi \to 3\,\phi) +$$

$$\left. 1 \times 420\; (xx\, /.\, \phi \to 3\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) + 0 \times 720\, (xx\, /.\, \phi \to 7\,\phi)\right)\ //$$

   `Expand; a322 = ExpToTrig[Expand[rep322]];`

$$\text{rep3212} = \frac{35}{5040} \left(35\, xx^7 + (-5)\; 21\, xx^5\, \text{Expand}[(xx\, /.\, \phi \to 2\,\phi)] + \right.$$

$$(-1)\, 70\, xx^4\, (xx\, /.\, \phi \to\, 3\,\phi) + 1\; 210\, xx^3\, (xx\, /.\, \phi \to 4\,\phi) + (-1)\, 105\, xx^3\, (xx\, /.\, \phi \to 2\,\phi)^2 +$$

$$1 \times 420\, xx^2\, (xx\, /.\, \phi \to\, 2\,\phi)\, (xx\, /.\, \phi \to 3\,\phi) + 0\; 504\, xx^2\, (xx\, /.\, \phi \to\, 5\,\phi) +$$

$$(-1)\; 840\, xx\, (xx\, /.\, \phi \to\, 6\,\phi) + 1 \times 630\, xx\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) +$$

$$(-1)\; 105\, xx\, (xx\, /.\, \phi \to 2\,\phi)^3 + (-1)\, 280\, xx\, (xx\, /.\, \phi \to 3\,\phi)^2 +$$

$$0\; 504\, (xx\, /.\, \phi \to 2\,\phi)\, (xx\, /.\, \phi \to 5\,\phi) + (-1)\; 210\, (xx\, /.\, \phi \to 2\,\phi)^2\, (xx\, /.\, \phi \to 3\,\phi) +$$

$$\left. 1 \times 420\; (xx\, /.\, \phi \to 3\,\phi)\, (xx\, /.\, \phi \to 4\,\phi) + 0 \times 720\, (xx\, /.\, \phi \to 7\,\phi)\right)\ //$$

```
      Expand; a3212 = ExpToTrig[Expand[rep3212]];
           14
rep231 = ———— (14 xx⁷ + (-4) 21 xx⁵ Expand[(xx /. φ → 2 φ)] +
          5040
      (-1) 70 xx⁴ (xx /. φ →  3 φ) + 2 210 xx³ (xx /. φ → 4 φ) + 2 × 105 xx³ (xx /. φ → 2 φ)² +
      (-1) 420 xx² (xx /. φ →  2 φ) (xx /. φ →  3 φ) + (-1)  504 xx² (xx /. φ →  5 φ) +
      0 840 xx (xx /. φ →  6 φ) + 0 × 630 xx (xx /. φ →  2 φ) (xx /. φ →  4 φ) +
      0 × 105 xx (xx /. φ →  2 φ)³ + 2 × 280 xx (xx /. φ →  3 φ)² +
      1 504 (xx /. φ →  2 φ) (xx /. φ →  5 φ) + (-1) 210 (xx /. φ →  2 φ)² (xx /. φ →  3 φ) +
      (-1) 420  (xx /. φ →  3 φ) (xx /. φ →  4 φ) + 0 × 720 (xx /. φ →  7 φ)) //
   Expand; a231 = ExpToTrig[Expand[rep231]];
           15
rep314 = ———— (15 xx⁷ + (-5) 21 xx⁵ Expand[(xx /. φ →  2 φ)] + 3 × 70 xx⁴ (xx /. φ →  3 φ) +
          5040
      (-1) 210 xx³ (xx /. φ →  4 φ) + (-1) 105 xx³ (xx /. φ →  2 φ)² +
      1 × 420 xx² (xx /. φ →  2 φ) (xx /. φ →  3 φ) + 0 × 504 xx² (xx /. φ →  5 φ) +
      0 840 xx (xx /. φ →  6 φ) + (-1) 630 xx (xx /. φ →  2 φ) (xx /. φ →  4 φ) +
      3 × 105 xx (xx /. φ →  2 φ)³ + 0 × 280 xx (xx /. φ →  3 φ)² +
      0 × 504 (xx /. φ →  2 φ) (xx /. φ →  5 φ) + (-1) 210 (xx /. φ →  2 φ)² (xx /. φ →  3 φ) +
      (-1) 420  (xx /. φ →  3 φ) (xx /. φ →  4 φ) + 1 × 720 (xx /. φ →  7 φ)) //
   Expand; a314 = ExpToTrig[Expand[rep314]];
            14
rep2213 = ———— (14 xx⁷ + (- 6) 21 xx⁵ Expand[(xx /. φ →  2 φ)] +
           5040
      2 × 70 xx⁴ (xx /. φ →  3 φ) + 0 × 210 xx³ (xx /. φ →  4 φ) + 2 × 105 xx³ (xx /. φ →  2 φ)² +
      0 × 420 xx² (xx /. φ →  2 φ) (xx /. φ →  3 φ) + (-1) 504 xx² (xx /. φ →  5 φ) +
      1 × 840 xx (xx /. φ →  6 φ) + 0 × 630 xx (xx /. φ →  2 φ) (xx /. φ →  4 φ) +
      (-2) 105 xx (xx /. φ →  2 φ)³ + (-1) 280 xx (xx /. φ →  3 φ)² +
      (-1) 504 (xx /. φ →  2 φ) (xx /. φ →  5 φ) + 2 × 210 (xx /. φ →  2 φ)² (xx /. φ →  3 φ) +
      0 × 420  (xx /. φ →  3 φ) (xx /. φ →  4 φ) + 0 × 720 (xx /. φ →  7 φ)) //
   Expand; a2213 = ExpToTrig[Expand[rep2213]];
           6
rep215 = ———— (6 xx⁷ + (-4) 21 xx⁵ Expand[(xx /. φ →  2 φ)] + 3 × 70 xx⁴ (xx /. φ →  3 φ) +
          5040
      (-2) 210 xx³ (xx /. φ →  4 φ) + 2 × 105 xx³ (xx /. φ →  2 φ)² +
      (-1) 420 xx² (xx /. φ →  2 φ) (xx /. φ →  3 φ) + 1 × 504 xx² (xx /. φ →  5 φ) +
      0 × 840 xx (xx /. φ →  6 φ) + 0 × 630 xx (xx /. φ →  2 φ) (xx /. φ →  4 φ) +
      0 × 105 xx (xx /. φ →  2 φ)³ + 0 × 280 xx (xx /. φ →  3 φ)² +
      1 × 504 (xx /. φ →  2 φ) (xx /. φ →  5 φ) + (-1) 210 (xx /. φ →  2 φ)² (xx /. φ →  3 φ) +
      1 × 420  (xx /. φ →  3 φ) (xx /. φ →  4 φ) + (-1) 720 (xx /. φ →  7 φ)) //
   Expand; a215 = ExpToTrig[Expand[rep215]];
          1
rep17 = ———— (xx⁷ + (-1) 21 xx⁵ Expand[(xx /. φ →  2 φ)] + 70 xx⁴ (xx /. φ →  3 φ) +
         5040
      (-1) 210 xx³ (xx /. φ →  4 φ) + 105 xx³ (xx /. φ →  2 φ)² +
      (-1) 420 xx² (xx /. φ →  2 φ) (xx /. φ →  3 φ) + 504 xx² (xx /. φ →  5 φ) +
      (-1) 840 xx (xx /. φ →  6 φ) + 630 xx (xx /. φ →  2 φ) (xx /. φ →  4 φ) +
      (-1) 105 xx (xx /. φ →  2 φ)³ + 280 xx (xx /. φ →  3 φ)² +
      (-1) 504 (xx /. φ →  2 φ) (xx /. φ →  5 φ) + 210 (xx /. φ →  2 φ)² (xx /. φ →  3 φ) +
      (-1) 420  (xx /. φ →  3 φ) (xx /. φ →  4 φ) + 720 (xx /. φ →  7 φ)) //
   Expand; a17 = ExpToTrig[Expand[rep17]];
S7 = {a7, a61, a52, a512, a43, a421, a321b, a413, a322,
   a3212, a231, a314, a2213, a215, a17};
S7Sym = {"[7]", "[6 1]", "[5 2]", "[5 1²]", "[4 3]", "[4 2 1]", "[3² 1]", "[4 1³]",
   "[3 2²]", "[3 2 1²]", "[2³ 1]", "[3 1⁴]", "[2² 1³]", "[2 1⁵]", "[1⁷]"};
S7dim = {1, 6, 14, 15, 14, 35, 21, 20, 21, 35, 14, 15, 14, 6, 1};
```

```mathematica
(* Redefinim els caràcters de C∞^φ de les irreps D₀ fins a D₅₀ dlim=
 50 en notació trigonometrica*)
For[i = 0, i ≤ dlim, i += 1/2 ,
  R_i = ExpToTrig[caracter[i]];
 ];

(* triem potència *)
<< input2.txt

(* comença el procés *)
output = {};
For[ k = 1, k ≤ Length[Sn], k++,
  reptrig = Sn[[k]];
  Print["representació reductible inicial Γ = ", reptrig];
  (* J maxima → Fiquem un valor per excés *)
  J = 25;
  Γ = 0;
  For[i = 0, i ≤ J, i++,
   If[Length[reptrig] == 0, Γ = Γ + reptrig D₀; Break[]];
   If[ reptrig[[2]] == Cos[φ/2], Γ = Γ + reptrig[[1]]/2 D_{1/2}; Break[] ];
   (*Característiques de la rep reductible*)
   cont = 0;
   (* nombre de termes que van sumats en la la rep reductible inicial reptrig*)
   lon = Length[reptrig];
   (*factor davant del Cos[n φ] amb el n major,
   que és el últim element de reptrig *)
   fact = reptrig[[lon, 1]];
   (* La longitud del terme amb el n major Cos[n φ] sempre serà 2 (2k Cos[n φ]) *)
   (* func → funció coseno del terme de major n *)
   func = reptrig[[lon, 2]];
   (* determinació del valor de n  *)
   If[func == Cos[φ], n = 1; cont = 1];
   If[cont == 0, n = func[[1, 1]]];
   Γ = Γ + fact/2 D_n;
   (* restem a la rep inicial la meitat de fact
    (perquè el terme és "k 2 Cos[n φ]") multiplicada pel caracter de la
        representacio irreductible  corresponent al valor
    n (atenció: que és la irrep 'n+1')*)
   reptrig = reptrig - fact/2 R_n // Expand;
   If[reptrig == 0, Break[]];
   If[n == 1, Γ = Γ + reptrig D₀; Break[]];
  ];
  Print["{Γ|", SnSym[[k]], "(dim = ",
   Sndim[[k]], ")} = ", Framed[Γ / Sndim[[k]] // Expand]];
  aux = {SnSym[[k]], Sndim[[k]]};
  output = AppendTo[output, {aux, Γ / Sndim[[k]] // Expand}];
 ];
Export["output.pdf", output];
```