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> eq1 := 0 = (1-q1-q2)*PI-beta*X*T-n*X;
eq2 := 0 = q1*PI + beta*X*T - (n+w)*E;
eq3 := 0 = q2*PI + (1-p)*w*E - (n+v)*L;
eq4 := 0 = p*w*E+v*L-(n+a+d)*T;

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$$eq1 := 0 = (1 - q1 - q2) \Pi - \beta X T - n X$$

$$eq2 := 0 = q1 \Pi + \beta X T - (n + w) E$$

$$eq3 := 0 = q2 \Pi + (1 - p) w E - (n + v) L$$

$$eq4 := 0 = p w E + v L - (n + a + d) T$$

(1)

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> sols := solve( {eq1,eq2,eq3,eq4},{X,E,L,T}):

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> sols[3];

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$$T = \text{RootOf}\left((a \beta n^2 + a \beta n v + a \beta n w + a \beta v w + \beta d n^2 + \beta d n v + \beta d n w + \beta d v w + \beta n^3 + \beta n^2 v + \beta n^2 w + \beta n v w) \_Z^2 + (\Pi \beta n p q2 w - \Pi \beta n p w - \Pi \beta n q2 v - \Pi \beta v w + a n^3 + a n^2 v + a n^2 w + a n v w + d n^3 + d n^2 v + d n^2 w + d n v w + n^4 + n^3 v + n^3 w + n^2 v w) \_Z - \Pi n^2 p q1 w - \Pi n^2 q2 v - \Pi n q1 v w - \Pi n q2 v w\right) \quad (2)$$

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> T2 := convert(sols[3],radical);

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$$T2 := T = \left( -\Pi \beta n p q2 w + \Pi \beta n p w + \Pi \beta n q2 v + \Pi \beta v w - a n^3 - a n^2 v - a n^2 w \right.$$

$$\left. - a n v w - d n^3 - d n^2 v - d n^2 w - d n v w - n^4 - n^3 v - n^3 w - n^2 v w \right.$$

$$+ \left( \Pi^2 \beta^2 n^2 p^2 q2^2 w^2 - 2 \Pi^2 \beta^2 n^2 p^2 q2 w^2 - 2 \Pi^2 \beta^2 n^2 p q2^2 v w + \Pi^2 \beta^2 n^2 p^2 w^2 + 2 \Pi^2 \beta^2 n^2 p q2 v w + \right.$$

$$+ 2 \Pi a \beta n^3 p q2 v w + 2 \Pi a \beta n^3 p q2 w^2 + 4 \Pi a \beta n^2 p q1 v w^2 + 2 \Pi a \beta n^2 p q2 v w^2$$

$$+ 4 \Pi \beta d n^4 p q1 w + 2 \Pi \beta d n^4 p q2 w + 4 \Pi \beta d n^3 p q1 v w + 4 \Pi \beta d n^3 p q1 w^2$$

$$+ 2 \Pi \beta d n^3 p q2 v w + 2 \Pi \beta d n^3 p q2 w^2 + 4 \Pi \beta d n^2 p q1 v w^2 + 2 \Pi \beta d n^2 p q2 v w^2$$

$$+ 4 \Pi \beta n^5 p q1 w + 2 \Pi \beta n^5 p q2 w + 4 \Pi \beta n^4 p q1 v w + 4 \Pi \beta n^4 p q1 w^2$$

$$+ 2 \Pi \beta n^4 p q2 v w + 2 \Pi \beta n^4 p q2 w^2 + 4 \Pi \beta n^3 p q1 v w^2 + 2 \Pi \beta n^3 p q2 v w^2$$

$$+ 2 \Pi^2 \beta^2 n p v w^2 + 2 \Pi^2 \beta^2 n q2 v^2 w - 2 \Pi a \beta n^4 p w + 2 \Pi a \beta n^4 q2 v - 2 \Pi a \beta n^3 p v w$$

$$- 2 \Pi a \beta n^3 p w^2 + 4 \Pi a \beta n^3 q1 v w + 2 \Pi a \beta n^3 q2 v^2 + 6 \Pi a \beta n^3 q2 v w$$

$$- 2 \Pi a \beta n^2 p v w^2 + 4 \Pi a \beta n^2 q1 v^2 w + 4 \Pi a \beta n^2 q1 v w^2 + 6 \Pi a \beta n^2 q2 v^2 w$$

$$+ 4 \Pi a \beta n^2 q2 v w^2 + 4 \Pi a \beta n q1 v^2 w^2 + 4 \Pi a \beta n q2 v^2 w^2 - 2 \Pi \beta d n^4 p w$$

$$+ 2 \Pi \beta d n^4 q2 v - 2 \Pi \beta d n^3 p v w - 2 \Pi \beta d n^3 p w^2 + 4 \Pi \beta d n^3 q1 v w + 2 \Pi \beta d n^3 q2 v^2$$

$$+ 6 \Pi \beta d n^3 q2 v w - 2 \Pi \beta d n^2 p v w^2 + 4 \Pi \beta d n^2 q1 v^2 w + 4 \Pi \beta d n^2 q1 v w^2$$

$$\begin{aligned}
& + 6 \Pi \beta d n^2 q_2 v^2 w + 4 \Pi \beta d n^2 q_2 v w^2 + 4 \Pi \beta d n q_1 v^2 w^2 + 4 \Pi \beta d n q_2 v^2 w^2 \\
& - 2 \Pi \beta n^5 p w + 2 \Pi \beta n^5 q_2 v - 2 \Pi \beta n^4 p v w - 2 \Pi \beta n^4 p w^2 + 4 \Pi \beta n^4 q_1 v w \\
& + 2 \Pi \beta n^4 q_2 v^2 + 6 \Pi \beta n^4 q_2 v w - 2 \Pi \beta n^3 p v w^2 + 4 \Pi \beta n^3 q_1 v^2 w + 4 \Pi \beta n^3 q_1 v w^2 \\
& + 6 \Pi \beta n^3 q_2 v^2 w + 4 \Pi \beta n^3 q_2 v w^2 + 4 \Pi \beta n^2 q_1 v^2 w^2 + 4 \Pi \beta n^2 q_2 v^2 w^2 + \Pi^2 \beta^2 v^2 w^2 \\
& - 2 \Pi a \beta n^3 v w - 2 \Pi a \beta n^2 v^2 w - 2 \Pi a \beta n^2 v w^2 - 2 \Pi a \beta n v^2 w^2 - 2 \Pi \beta d n^3 v w \\
& - 2 \Pi \beta d n^2 v^2 w - 2 \Pi \beta d n^2 v w^2 - 2 \Pi \beta d n v^2 w^2 - 2 \Pi \beta n^4 v w - 2 \Pi \beta n^3 v^2 w \\
& - 2 \Pi \beta n^3 v w^2 - 2 \Pi \beta n^2 v^2 w^2 + a^2 n^6 + 2 a^2 n^5 v + 2 a^2 n^5 w + a^2 n^4 v^2 + 4 a^2 n^4 v w \\
& + a^2 n^4 w^2 + 2 a^2 n^3 v^2 w + 2 a^2 n^3 v w^2 + a^2 n^2 v^2 w^2 + 2 a d n^6 + 4 a d n^5 v + 4 a d n^5 w \\
& + 2 a d n^4 v^2 + 8 a d n^4 v w + 2 a d n^4 w^2 + 4 a d n^3 v^2 w + 4 a d n^3 v w^2 + 2 a d n^2 v^2 w^2 \\
& + 2 a n^7 + 4 a n^6 v + 4 a n^6 w + 2 a n^5 v^2 + 8 a n^5 v w + 2 a n^5 w^2 + 4 a n^4 v^2 w + 4 a n^4 v w^2 \\
& + 2 a n^3 v^2 w^2 + d^2 n^6 + 2 d^2 n^5 v + 2 d^2 n^5 w + d^2 n^4 v^2 + 4 d^2 n^4 v w + d^2 n^4 w^2 \\
& + 2 d^2 n^3 v^2 w + 2 d^2 n^3 v w^2 + d^2 n^2 v^2 w^2 + 2 d n^7 + 4 d n^6 v + 4 d n^6 w + 2 d n^5 v^2 \\
& + 8 d n^5 v w + 2 d n^5 w^2 + 4 d n^4 v^2 w + 4 d n^4 v w^2 + 2 d n^3 v^2 w^2 + n^8 + 2 n^7 v + 2 n^7 w \\
& + n^6 v^2 + 4 n^6 v w + n^6 w^2 + 2 n^5 v^2 w + 2 n^5 v w^2 + n^4 v^2 w^2)^{1/2} \Big) / (2 \beta (a n^2 + a n v \\
& + a n w + a v w + d n^2 + d n v + d n w + d v w + n^3 + n^2 v + n^2 w + n v w))
\end{aligned}$$

**> with (CodeGeneration) :**

**> Matlab (T2, resultname="TEST") ;**

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TEST = T == (- (PI * beta * n * p * q2 * w) + (PI * beta * n * p * w)
+ (PI * beta * n * q2 * v) + (PI * beta * v * w) - (a * n ^ 3) - (a *
n ^ 2 * v) - (a * n ^ 2 * w) - (a * n * v * w) - (d * n ^ 3) - (d * n
^ 2 * v) - (d * n ^ 2 * w) - (d * n * v * w) - (n ^ 4) - (n ^ 3 * v)
- (n ^ 3 * w) - (n ^ 2 * v * w) + sqrt((PI ^ 2 * beta ^ 2 * n ^ 2 * p
^ 2 * q2 ^ 2 * w ^ 2 - 2 * PI ^ 2 * beta ^ 2 * n ^ 2 * p ^ 2 * q2 * w
^ 2 - 2 * PI ^ 2 * beta ^ 2 * n ^ 2 * p * q2 ^ 2 * v * w + PI ^ 2 *
beta ^ 2 * n ^ 2 * p ^ 2 * w ^ 2 + 2 * PI ^ 2 * beta ^ 2 * n ^ 2 * p
* q2 * v * w + PI ^ 2 * beta ^ 2 * n ^ 2 * q2 ^ 2 * v ^ 2 - 2 * PI ^
2 * beta ^ 2 * n * p * q2 * v * w ^ 2 + 4 * PI * a * beta * n ^ 4 * p
* q1 * w + 2 * PI * a * beta * n ^ 4 * p * q2 * w + 4 * PI * a * beta
* n ^ 3 * p * q1 * v * w + 4 * PI * a * beta * n ^ 3 * p * q1 * w ^ 2
+ 2 * PI * a * beta * n ^ 3 * p * q2 * v * w + 2 * PI * a * beta * n
^ 3 * p * q2 * w ^ 2 + 4 * PI * a * beta * n ^ 2 * p * q1 * v * w ^ 2
+ 2 * PI * a * beta * n ^ 2 * p * q2 * v * w ^ 2 + 4 * PI * beta * d
* n ^ 4 * p * q1 * w + 2 * PI * beta * d * n ^ 4 * p * q2 * w + 4 *

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[illegible]

$$\frac{(w^2 + 4 d n^4 v^2 w + 4 d n^4 v w^2 + 2 d n^3 v^2 w^2 + n^8 + 2 n^7 v + 2 n^7 w + n^6 v^2 + 4 n^6 v w + n^6 w^2 + 2 n^5 v^2 w + 2 n^5 v w^2 + n^4 v^2 w^2))}{\beta (a n^2 + a n v + a n w + a v w + d n^2 + d n v + d n w + d v w + n^3 + n^2 v + n^2 w + n v w)} / 0.2e1;$$

$$\begin{aligned} & \{eq1, eq2, eq3, eq4\} \\ & \{0 = q1 \Pi + \beta XT - (n + w) E, 0 = q2 \Pi + (1 - p) w E - (n + v) L, 0 = (1 - q1 - q2) \Pi \\ & \quad - \beta XT - n X, 0 = p w E + v L - (n + a + d) T\} \end{aligned} \tag{4}$$

$$\begin{aligned} & \mathbf{b}; \\ & \qquad \qquad \qquad b \end{aligned} \tag{5}$$

$$\begin{aligned} & \text{solve}(\{\mathbf{x+y=2}\}, \{\mathbf{x}\}); \\ & \qquad \qquad \qquad \{x=2-y\} \end{aligned} \tag{6}$$