Step 1: We set the given PDE for $F(x, y, z, t)$ in the form $\Psi(F, F_x, F_y, F_z, F_{xx}, \ldots) = 0$. Using the transformation $F = F(w)$ and $w = \alpha x + \beta y + \gamma z - ct$, we convert the given nonlinear partial differential equation to the following differential equation:

$$\Psi(\Phi, \Phi', \Phi'', \ldots) = 0, \tag{4}$$

where α, β, γ and c are arbitrary constants, and they need to be determined later in the manuscript.

Step 2: Let us suppose that JM eq. (3) has the following assumed solution:

$$\Phi(w) = \frac{p_1 e^{q_1 w} + p_2 e^{q_2 w}}{p_3 e^{q_3 w} + p_4 e^{q_4 w}}, \tag{5}$$

where p_1, p_2, p_3, p_4 and q_1, q_2, q_3, q_4 are real/complex constants for obtaining the travelling wave solution of eq. (3) which is given by

$$\Phi(w) = A_0 + \sum_{k=1}^{N} A_k \Phi(w)^k + \sum_{k=1}^{N} B_k \Phi(w)^{-k}, \tag{6}$$

where A_0, A_k, B_k $(1 \leq k \leq N)$ and p_n, q_n $(1 \leq n \leq N)$ are constants to be determined, such that solution (6) satisfies eq. (4). Here, positive integer N needs to be computed using balancing principle.

Step 3: By substituting eq. (6) into eq. (4) and collecting all terms, the following polynomial equation will be obtained:

$$P(Z_1, Z_2, Z_3, Z_4) = 0 \tag{7}$$

in terms of $Z_i = e^{q_i w}$ for $i = 1, \ldots, 4$. Setting each coefficient of P to zero, we derive a set of algebraic equations for p_n, q_n $(1 \leq n \leq 4)$ and α, β, γ, c, A_0, A_1, B_1, using the computer algebra software *Mathematica/Maple*.

Step 4: In this step, we obtained the solution of algebraic equations, and using these non-trivial solutions in (6), one can obtain new dispersive soliton solutions of eq. (3).