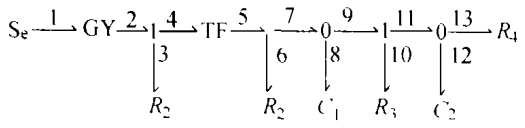

Fig. 8 After omitting I_1, I_2, bond grap model of two couple water tank

Simulation results by equation (20) are shown as curve (3) in Fig. 4 and Fig. 5. Compared with curve (2), the performance changes are very small. However, the control algorithm is simpler. On the other hand, the example also proves that algorithm can control time-varying plant.

4 Conclusion

A hybrid qualitative and quantitative control algorithm (HQQC) based on improved bond graph theory is proposed in this paper. By simplifying qualitative equation, the control algorithm can be deduced. Inserting quantitative value of important parameter into the control algorithm can get higher control precision. Simulation results prove that the algorithm has better performance than PID control; for example, it has strong robust, good transient response and track performance. It gives a bright promise to control plant with variable parameters, nonlinear and strong disturbance. Future work on the approach is added to error scale factor SF_e, error change scale factor SF_{ec} and output scale factor SF_o to control equation so that an adaptive control algorithm can be constructed.

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