Based on models of rate equations of passive Q- switching which were prepared
in previous studies and containing three or four equations. In this study, a proposalwas made to formulate a model of coupled rate equations with six first-orderdifferential equations to simulate the passive Q-switching technique in laser systemswhose effective mediums are characterized by a range of spectral lines. That
constitute more than a system of energy levels for those spectral lines as is the caseof rare- earth element neodymium which doped YAG crystal (Nd^{+3}: YAG).
This model was tested in the utilization of neodymium ions spectral lines $^4F_{3/2}$,$^4I_{11/2}$, $^4I_{9/2}$, which constitute a four-levels energy system and the semi three-levelsenergy system for a single active medium with the crystal Cr^{+4}: YAG as a saturable
absorber material, using Rung-Kutta-Fahlberg numerical method in a softwarecomputer program prepared in this study.
The results obtained showed a good agreement with concerning to the behavior
and construction of both pulse photons, the behavior of population inversion density
of active medium ions, and the temporal variation of saturable absorber energy level
population with theoretical bases of passive Q-switching method, and the single
pulse behavior generated by the use of previous equations models. This enhances the
reliability of the physical basis and mathematical formula of the equations model.
The effect of important essential parameters on the construction, generation,
and characteristics of dual pulses generated has been studied. The results showed
that the increasing of ions density of SA leads to an increase in the energy of the
dual passive q-switching laser pulses, while the duration decrease as a function ofions density of the SA, which provides a high-power laser pulses. The results showedthat the gradual buildup of both pulses and the pulses reached to maximum photonsdensity in later time when the value of l_{am} increase, The results also showed anincrease in pulse duration and decrease in each other's energy and power whileincreasing the effective medium length. An increase in the length of the SA leads tothe construction and release of pulses in advanced (earlier) time, decreased in theirduration, and increased energy and the power of both pulses. The

results showed theconstruction and release the pulses in late times as the value of output coupler mirror
reflectivity increased, and the results showed the increase of energy and the powervalues of both pulses .The instantaneous temporal behavior of the absorption activity shown by thesaturable absorber material toward the photons of both passive Q-switching pulsesas a function of the ion's number density was studied. The results showed that thesteady state of absorption activity or loss in the photons of both pulses within thecavity, and the state of optical bleaching which represents the conversion ofabsorbent material to transparent status in relation to its absorption of photons areoccur at an advanced time with the increasing of ions number density of saturable absorber material ions.