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## Rotating neutron star in strong magnetic fields and the MR relations

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Neutron stars are highly magnetized rotating compact stars. In 2010, a neutron star named PSR J1614-2230 has a mass of twice the solar mass ( $1.97 \pm 0.04 M_{\odot}$ ). In 2013, a neutron star named PSR J0348+0432 with a mass of  $2.01 \pm 0.04 M_{\odot}$  was observed. Such massive neutron stars give strong constraints on the equation of state (EoS) of neutron star matter. In this study, we calculate radius of a neutron star using a perturbative prescription for various EoSs and relations of its total mass increased by magnetic fields. Also, we calculate the radius of the neutron star as a function of its total mass increased by rotation. As for the EoS, we use RMF theory. Moreover, we calculate mass-radius (MR) relation with both rotation and magnetic fields using 5 hadronic EoSs. We have the results of MR relation with both rotation and magnetic fields have the total mass of over twice the solar mass for all 5 hadronic EoSs.

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