



**Seismic Hazard Evaluation by Gutenberg-Richter and Poisson Models,
Drawing b-value Map and Calculation of MCE & DBE Values for the
Province of Khorasan-Razavi**

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Abstract:

For writing this academic essay, at first, we have carried out the tectonic and geological study and analysis of Khorasan-Razavi province as preparation, thus we could draw the Seismotectonics Map of Khorasan-Razavi. After that, we have carried out a seismic hazard evaluation of Khorasan-Razavi and have calculated the amounts and indexes of that by two functions: Gutenberg-Richter & Poisson. An earthquake is an unpredictable event in regarding to its magnitude and origin time; therefore, to assess and evaluate the merits of data and also predicting Khorasan-Razavi seismic future, we need to choose the reasonable distribution functions as method for calculating the earthquake magnitude or predicting its origin time or making estimate of both of them after sorting and arranging date. In this way, the Gutenberg-Richter and Poisson functions that are basically used to write this essay are popular than others. The earthquake data of Khorasan-Razavi which include magnitude, latitude and longitude of its epicenter, origin time and depth during 112 years period (from 1903 to 2015) have been collected from some reliable local and international sites. For using the data to write this essay, we combined all of earthquake information as step one, and second removed the repetitive earthquakes and aftershocks, and also normalized its scales as finally step. The results are illustrated as the percentage of chance of an earthquake diagram and return period an earthquake diagram in this essay text. For drawing b-value maps, first of all, all around the province are covered by geologic maps in 1:250000 scale of Geological survey & Mineral Exploration of Iran, and then we specify the active faults as seismic sources in each map. We can specify the seismic sources by overlapping the fault map with earthquake epicentral map of mentioned area. In the next step, according to the distribution of earthquakes in each mentioned geologic map, we calculate its seismic parameters (a-value & b-value) by Gutenberg-Richter equation. As third step, according to the average of b-value amount, the b-value distribution map of Khorasan-Razavi province is drawn in each of geologic map. Moreover, as we know, to provide building solidity for probable earthquake, two earthquake magnitudes (Design Based Earthquake & Maximum Credible Earthquake) are originally calculated, so we calculate the two mentioned numbers by relative equations. In addition, according to being earthquake-prone Khorasan-Razavi and being it as the first destination of pilgrimage and tourism among Iranian, the goal of this study is that giving a widely-held and extreme view of seismic and tectonic background of Khorasan-Razavi province. We hope that all of earthquake experts and scientists and crisis managers of Khorasan-Razavi province use the results of this essay as a sensible and reasonable source to prevent and reduce earthquake hazard, risk and disasters.

Keywords: KhorasanRazavi, b-value, Gutenberg-Richter, Poisson, Design Based Earthquake, Maximum Credible Earthquak.