

VI SEMESTER HONOURS

PAPER XIV

UNIT II

2(e) Magnitude and intensity of earthquake:

Earthquakes can be measured in two ways. One method is based on magnitude—the amount of energy released at the earthquake source. The other is based on intensity—how much the ground shakes at a specific location.

Magnitude:

energy released by an earthquake is magnitude..it is calculated by the amplitude of seismic wave and determined by seismograph(an instrument which records ground vibration

Charles Richter developed the Richter Scale in 1935. His scale worked like a seismogram, measured by a particular type of *seismometer* at a distance of 100 kilometers (62 mi) from the earthquake.) Richter scales is open ended scale and logarithmic scale.

Earthquakes 4.5 or higher on the Richter scale can be measured all over the world. An earthquake a size that scores 3.0 is about 10 times the amplitude of one that scores 2.0. The energy that is released increases by a factor of about 32.

Every increase of 1 on the Richter scale corresponds to an increase in amplitude by a factor of 10; therefore, it is a logarithmic scale that means magnitude 2 is 10 times higher than 1.

Table: On the basis of magnitude an earthquake is divided into :

MAGNITUDE	CLASSIFICATION
≥8.0	GREAT
7.0-8.0	MAJOR
5.0-7.0	MODERATE
3.0-5.0	SMALL
1.0-3.0	MICRO
M≤1.0	ULTRA MICRO

Intensity:

Intensity is the effect of an earthquake on the earth 'surface and it can be measured by modified mercalli (MM) intensity scale. It was developed by seismologist Mercalli in 1902.

The **Modified Mercalli intensity scale (MM or MMI)**, descended from Giuseppe Mercalli's **Mercalli intensity scale** of 1902, is a seismic intensity scale used for measuring the intensity of shaking produced by an earthquake. It measures the effects of an earthquake at a given location, distinguished from the earthquake's inherent force or strength as measured by seismic magnitude scales

The lower degrees of the Modified Mercalli Intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage.

Table gives Modified Mercalli scale intensities that are typically observed at locations near the epicenter of the earthquake.

I. Not felt	Not felt except by very few under especially favorable conditions.
II. Weak	Felt only by a few people at rest, especially on upper floors of buildings.
III. Weak	Felt quite noticeably by people indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV. Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V. Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI. Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII. Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII. Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX. Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Liquefaction.
X. Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI. Extreme	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipe lines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII. Extreme	Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

Table : showing difference between magnitude and intensity.

> MAGNITUDE :	> INTENSITY
<ul style="list-style-type: none"> ▪Magnitude is a quantitative measure of the actual size of the earthquake. ▪Measured by Richter Scale ▪Denoted by M(number) i.e. M8 or M7.7 ▪Same at every places like M7 	<ul style="list-style-type: none"> ▪Intensity is an indicator of the severity of shaking generated at a given location ▪ Measured by Mercalli scale ▪severity of shaking is much higher near the epicenter than farther away. ▪Intensity is varies at each and every place.

Table showing magnitude,intensity (MMI) and damages due to earthquake

Richter Scale	Mercalli Intensity	Shaking	Description/Damage
1.0 - 3.0	I	Not felt	Not felt except by a very few under especially favorable conditions.
3.0 - 3.9	II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
	III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0 - 4.9	IV	Light	Felt indoors by many, outdoors by few. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
	V	Moderate	Felt by nearly everyone. Some windows broken. Unstable objects overturned.
5.0 - 5.9	VI	Strong	Felt by all. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
	VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures.
6.0 - 6.9	VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, monuments, walls.
	IX	Violent	Damage considerable in specially designed structures. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
	XI	Extreme	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
	XII	Extreme	Total damage. Lines of sight and level are distorted. Objects thrown into the air.