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Internal Assessment Test 1 – Mar. 2018																
Sub:	Earthquake resistant design of structures					Sub Code:	10CV834		Branch:	Civil						
Date:	14/03/18		Duration:	90 min's		Max Marks:	50		Sem / Sec:	VIII A & B			OBE			
<u>Answer any All questions</u>											MARKS	CO	RBT			
1	Explain the primary and secondary effects of earthquake.										10	CO1	L2			
2	What is seismic zoning? Explain seismic zoning of India as per IS 1893 2016.										10	CO1	L2			
3	Explain Reid's elastic rebound theory with neat sketches.										10	CO1	L2			
4	Explain the theory of plate tectonics										10	CO1	L2			
5	Explain the earthquake ground motion characteristics										10	CO1	L2			

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CI

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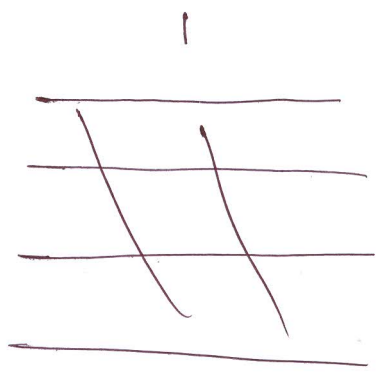
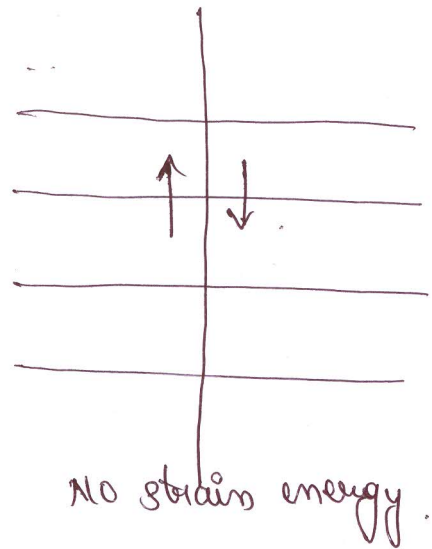
* After the San. Francisco, California earthquake, the earthquake fault line is straight and 270 million in distance.

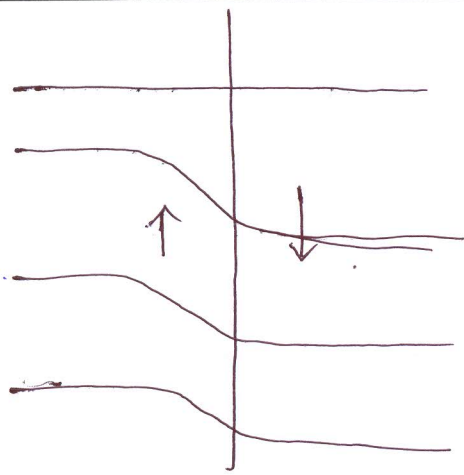
* The two blocks are moved in opposite direction. The one block is moved downward about 27 feet from other block.

* Scientists says what is the reason for that and why?

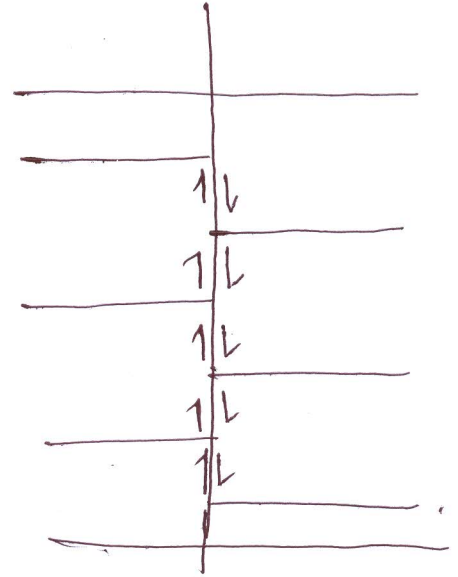
* In 1906, H.F. Reid, produce a theory that is Rebound theory.

* The strain energy in the Earth is released and forms a rebound theory.





strain energy present.



figures shows the details of rebound theory.

* In figure ①, the two blocks which are Eastern block moves Southern region and western block moves Northern region. But in this case there is no release of strain energy. Since fault lines are in same position only.

* After continuous release of energy, the fault line is starts to move, shown in figure ②

* If the Energy is completely released, the weakest fault gets broken and they travel with their direction. Small arrow marks shows the depth of fault line that moved from its original position.

This phenomenon of release of strain energy of the weakest fault is known as Rebound theory.

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- * After the pioneer work, of Wegener proposed a theory that is continental drift theory.
 - * He proposed continental drift theory in his book "Origin of ocean and continent".
 - * In this books, he said that "Continents are formed in a huge mass known as Pangea in 1915 and that large mass are starts to split, moved their original position in the globe."
 - * But this theory is not accepted by any scientists because he didn't explain what kind of forces are induced to move that large mass and how they are split.
 - * After Wegener's died, the continental drift theory is modified and gives a plate name as plate tectonic theory in 1930.
 - * After fifty years, continental drift theory is published as plate tectonic theory.
 - * It shows the earth layers such as lithosphere, Atmosphere.
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* The plates are divided into 12 major plates such as Australia, Eurasia, Nazca, Cocos, India, South ^{America} ~~Africa~~, North ^{America} ~~Africa~~, Philippines, Africa, etc.

* The plates are divided using boundaries they are.

- (i) Divergence boundaries
- (ii) Convergence boundaries
- (iii) Transform boundaries.

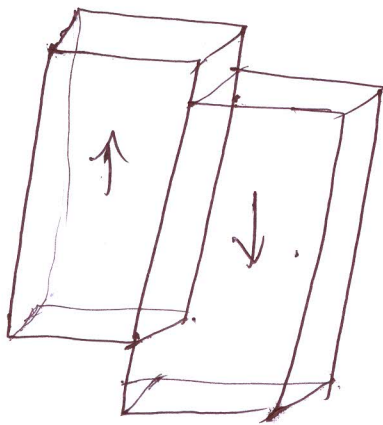
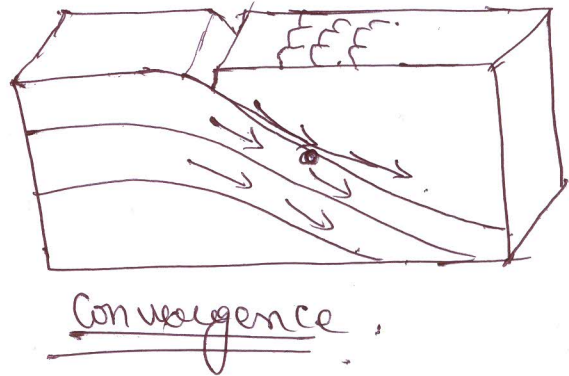
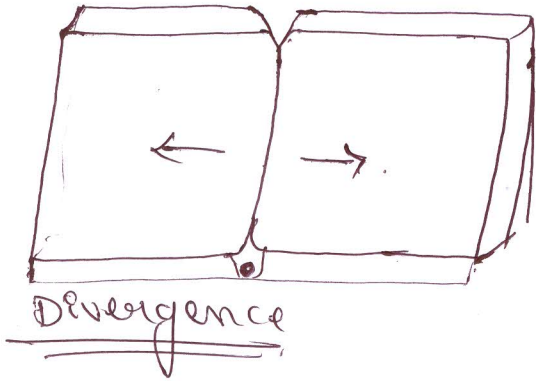
* Divergence boundaries are those in which the blocks are move away from each other. Due to this, pressure is created inside the Earth and earthquakes will occur.

* Convergence boundaries are those in which the blocks / faults are move towards each other since one plate is move inside to another plate.

Due to this, formation of Himalayas, etc... are takes place.

Eg:- Indian plate towards Eurasian plate.

* Transform boundaries are those in which the plates are move parallelly but in opposite direction.



In convergence boundaries they are 3 types

- (i) oceanic-oceanic boundary
- (ii) Continental-oceanic
- (iii) Continental-Continental

Transform boundaries

Primary effects of Earthquake

the losses directly from Earthquake and it self is called primary losses.

The primary effects are

(i) land slide :- During the earthquake, this type of loss is occurred in slope region.

Due to earthquake, the soil become loose and it fall down.

(ii) Cracks :- This is ~~one~~ type is occurred in structures (or) in roads also.

If the earthquake is less in magnitude, the depth, length of crack is also less and it doesn't affect human life.

These can easily repaired.

(iii) Differential settlement :-

Due to earthquake, the soil present underneath the structure, will compacted and that structure is settled down. This type of phenomenon known as differential settlement.

(77) Secondary effects of Earthquake.

The results directly from the primary effects.

Some secondary effects are

(i) Tsunami :-

This is occur in ocean part.

* The energy inside the ocean is higher, then the Tsunami will occur.

* The depth and it inside the ocean is less during Tsunami and it travel towards the shore in the form of waves.

* If the Tsunami occur in shore, then damage of structure are more. because -

- At the shore, the velocity and depth is also high. Due to this the waves are travel very fastly.

* waves travel in horizontal direction towards some other place, there is no damage of ^{structures} because the depth of waves and velocity is also reduced.

(ii) Liquifaction :-

The loosen of stress in the soil is called liquifaction.

During Earthquake, the soil interaction between soil particles are loosened / lased and they became like a fluid. Due to this, the structure on that soil will collapse early.

(iii) Volcanies :-

The lava inside the Earth is exploded to due to more energy created ~~inside~~ the Earth. Because of this the magma try to push the lava outside (or) on rocks. Rocks are broken. ~~and they explodes~~

The division of zones according their int. earthquake intensity & magnitude, is this type of division is known as seismic zoning.

- ✦ Earlier, there is no earthquake resistance structures.
- ✦ Due to continuous earthquake, the scientists are started to built a earthquake resistance structure.
- ✦ After 1897, Assam earthquake, the earthquake resistance structure is built up.
- ✦ In 1930's earthquake, they propose a first seismic map.
- ✦ 1935 Quetta earthquake.
- ✦ There is no historical data about earthquake before 200 years ago.
- ✦ In 1935 quetta earthquake, they shows some interest on systematic and code of earthquake.
- ✦ In 1962 BIS proposed earthquake codes and it gives 7 zones in India according

MMI Scale ~~is~~ intensity

Zone	Intensity
<u>ED</u>	<u>< IV</u>
<u>I</u>	<u>V</u>
<u>II</u>	<u>VI</u>
<u>III</u>	<u>VII</u>
<u>IV</u>	<u>VIII</u>
<u>V</u>	<u>IX</u>
<u>VI</u>	<u>X</u>
<u>VII</u>	X and above

* But in 1967, they ~~gave~~ shows some results about zoning.

* In 1967, they revision of zoning and collection of data take place.

* After Kiyonna Earthquake, the zones are modified into V zones.

They are I, II, III, IV, & V and their intensity V, VI, VII, VIII & IX. using MMI scale.

* After ~~this~~ continuous revision, in 2004, the zones are again modified into IV zones they are II, III, IV & V.

* Here Deccan plateau is the safe zone.
They coming under zone I & II.

* Delhi, Kolkata, Jammu, Uttar Pradesh etc. They are under zone IV.

* In zone I, is dangerous zone. The earthquake intensity is more in that place.

* So most of southern part of India are in zone II.

They are 5 major earthquake ground motion characteristics,

1) Amplitude

2) Duration

3) Distance.

4) Geological, Geophysical and Geotechnical data.

5) Ground motion level.

ie Amplitude :-

During earthquake, the waves are travel in vertical and in horizontal direction.

in \downarrow

There is no damage during vertical motion because the loads are acting vertically only.

The horizontal movement of waves are known as peak ground motion acceleration (PGA).

PGA should be less than $\underline{1}$.

Q. Duration:-

The time required to release energy in a causative fault is known as duration.

Thus, increases the duration by increasing the earthquake motion.

Q. Distance:-

The waves travel in solid medium / in the earth. They

~~At~~ ~~farthest~~ P