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Q1#

What causes earthquakes? If the Richter magnitude reaches at 8 or above what will be the consequences? Dif betw primary and secondary waves?

Ans:-

## EARTHQUAKE :-

The earth ~~quake~~ has four major layers.

The inner core, Outer core, mantle, and crust.

The crust and the top of mantle make up a thin skin on the surface of our planet.

But this skin is not all in one piece. It is made up of many pieces like a puzzle covering the surface of the earth.

Not only that but these puzzle pieces keep slowly moving around sliding past one another and bumping into each other.

We call these puzzle pieces tectonic plates and the edges of plates are called the plate boundaries. The plate boundaries are made up of many faults, and most of the earthquakes around the world occur on these faults, and most of the earthquakes around the world. Since the edges of the plates are rough they get stuck while the rest of the plate keeps moving.

Finally, when the plate has moved far enough, the edges unstuck on one of the faults and there is an earthquake.

### \* PRIMARY WAVES \*

The first kind of body wave is the primary wave.

They travel through the Earth's

interior and can pass through both solid and molten rock. they shake the ground back and forth.

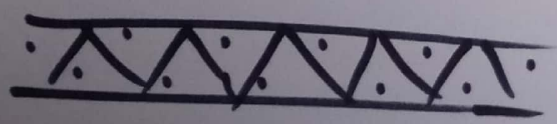
Typical speeds are 330 m/s in air, 1450 m/s in water and about 5000 m/s in granite.

### \* SECONDARY WAVES \*

The second type of body wave is secondary wave which is the second wave you feel in an earthquake.

Secondary wave lag behind primary wave. as they travel 1.7 times slower

However they do more damage because they're bigger and shake the ground vertically and horizontally.



Q2 Describe the role of geology in selection of sites for dams and reservoirs?

Ans:-

## Detailed ~~Preliminary~~ Geological Investigation of Dam Site Construction.

- => Study of Geological Toposheet.
- => Study of the Area with reference to Geology.
- => Study of Rock types.
- => Study of <sup>Structural</sup> Geology of the area.
- => History of area with reference to Rainfall data.
- => Study of Stream Channels with Different orders.
- => Study of Seismic data of the area.
- => Geomorphological Study.

- => Preparation of Geological map of the area in detail.
- => Study of core Drill data and its interpretation.
- => Detailed Engg. Geological Properties of the area.

## Preliminary Geological Investigation of Dam Construction:

- 1) Topographical studies.
- 2:- Reservoir location.
- 3:- Petrology studies.
- 4:- Mineralogy studies.
- 5:- Structural Geological studies.
- 6:- Geological factors like foundation, conditions, water tightness of reservoir, availability of construction material.
- 7:- General examination of rocks.
- 8:- Indirect study methods for sub surface investigations.

## \* Selection of Sites \*

Selection of Site is based on following basis.

### \* Topographicallly \*

Most suitable place must be chosen for construction. Ideally it must be a narrow gorge or a small valley with enough catchment area available behind so that calculated amount of water can be easily stored in the reservoir created upstream.

### Location of Spillway:-

All dam should have an adequate spillway for passing flood flows. If a river gorge is narrow then there may not be sufficient spillway width available and a suitable location other on the periphery of the

has to be found to locate a spillway

## \* Possibility of river diversion during construction.

The way, river can be diverted at a particular site for making way for construction of the dam may affect the design of the dam and also the construction schedule.

## Sedimentation Possibilities:-

The average quantity of sediment carried by the river has to be known, as precisely as possible, which would

## \* Technically \*

The site must be sound as possible. Strong impermeable and stable. Strong rocks make the job of designer easy.



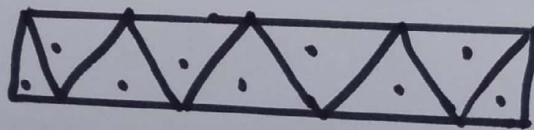
Impermeable Sites ensure better storage inventories. Site must be stable with respect to seismic shocks slope failures around dam.

## \* Constructionally \*

The site should be far from the materials which will be used for the construction. Their non-availability will make the cost of project high.

## 1-Human welfare:-

Site Selection should be done in such a way that it must cause minimum damage to public in the destruction



Q3#

What are the different types of mass wasting? Also explain the protective measures of landslides?

Ans:-

Downslope mass movement of rocks, regolith and soil under the influence of gravity (excludes material transported downslope by streams, winds etc).

### SLUMPS:-

A type of slides wherein down ward rotation of rock or regolith occurs along a curved surface due to over steepening.

### \* ROCK AND DEBRIS FALL \*

Happens when a piece of rock fall down the slope.

Debris fall are similar, except they involve a mixture of soil

regolith, and rocks.

At the base there is an accumulation of fallen material termed talus.

## \* ROCK AND DEBRIS SLIDES \*

Happens when rock or debris slides down a preexisting surface.

## \* FLOW \*

Flow of soil and regolith containing a large amount of water.

## \* CREEP \*

The gradual downhill movement of soil and regolith.

## \* SOLIFLUCTION \*

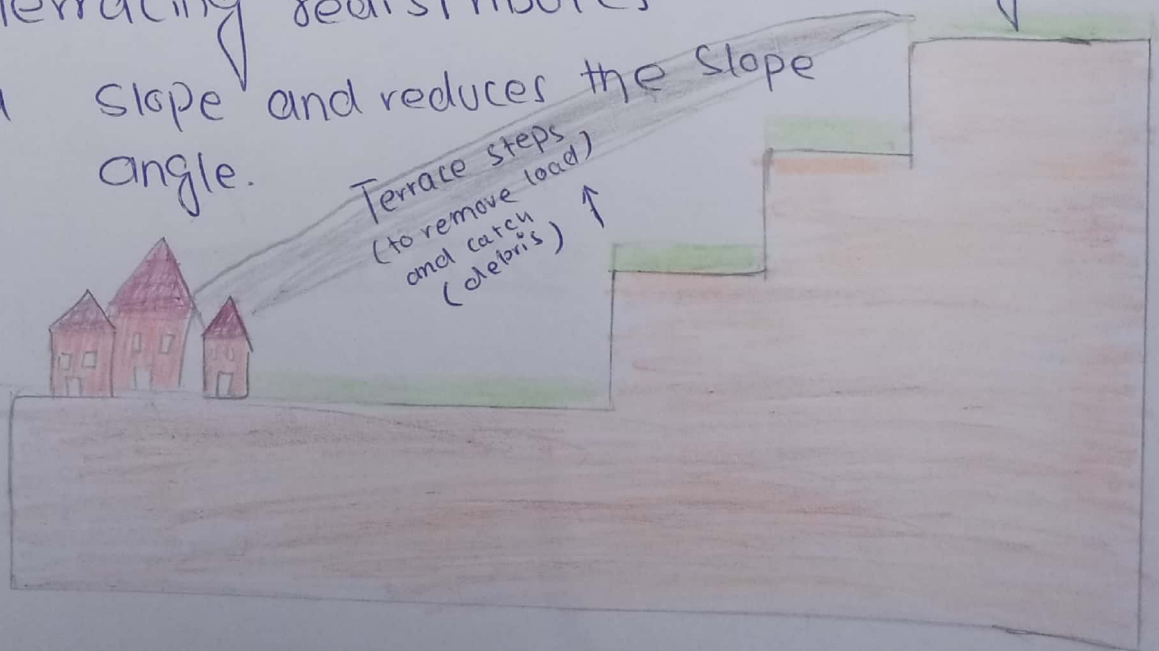
Is flow of saturated soil down slope at a rate of a few millimeters or a few centimeters per day or per year.

## \* PERMAFROST \*

Slow land slides due to slowly melting of permanently frozen ground.

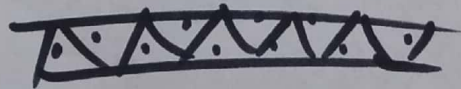
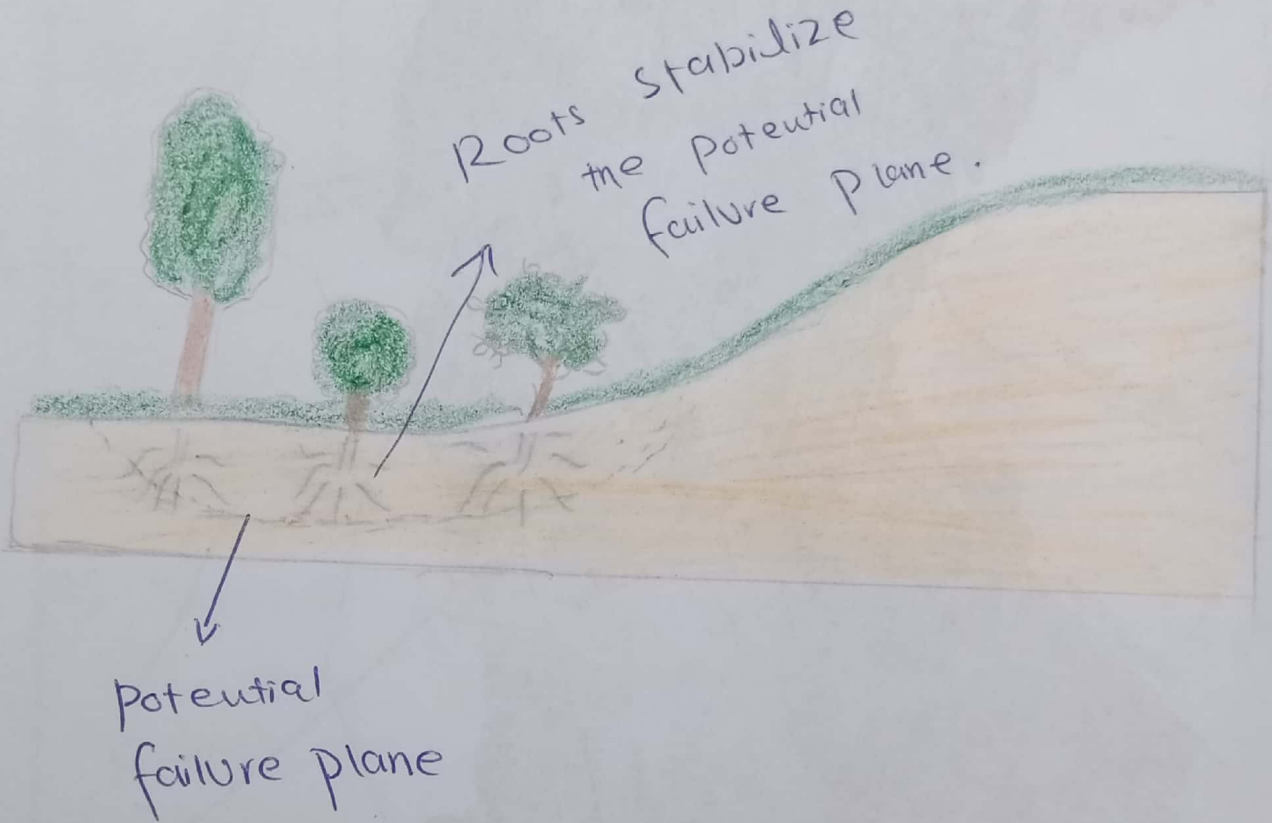
## Reducing land slides.

\* Terracing redistributes mass along a slope and reduces the slope angle.



# Reducing landsliding.

- ★ Revegetation with plants that have deep roots.



Q4 Differentiate fault, Joints, and folds?

Ans:-

**FAULT:-**

fracturing and displacement of rocks occur.

**JOINT:-** fracture along which no displacement has occurred.

**FOLD:-**

In response to compression force the strata may bend and buckle these are called folds.

(A) Normal faults Cause to the surface of the Earth:-

Normal faults Cause half grabens to the surface of the Earth.

(B) Folds Develop in which Type of Rocks:-

Folds develop in Sedimentary strata.

(C) Effects of Fault On Outcrop:-

The effect of fault is a horizontal shift between the two parts of the outcrop.

(D)

must be avoided to possible extent to be on all three.

Q5

Describe tunneling on the basis of geology? Also determine geological investigation of tunnel?

Ans:-

### \* TYPES OF TUNNELS \*

ON the basis of geology

- 1 Hard Rock Tunnels.
- 2 Soft Rock Tunnels.

#### Soft Rock Tunnels:-

Ground (earth) workers dig soft-ground tunnels through clay, silt, sand, gravel or mud.

#### Hard Rock Tunnels:-

Tunneling through hard rock almost always involves blasting.

#### Geological Investigations For Tunnels:-

"These determine to a large extent solutions to following engineering problems connected with tunneling.

#### a Selection Of Tunnel Route (Alignment):-

There might be available many alternate alignments that could connect two points through a tunnel.

However, the final choice would be

greatly dependent on the geological Constitution along the and around different alternatives. the alignment having least geologically negative factors would be the obvious choice.

## B) Selection of Excavation

### Method:-

Tunneling is a complicated process in any situation and involves huge costs which would multiply manifolds if proper planning is not exercised before starting the actual excavation.

And the excavation methods are intimately linked with the type of rocks to be excavated. Choice of the right method will, therefore be possible only when the nature of the rocks and the ground all along the alignment is fully known.

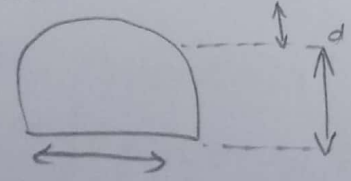
This is one of the most important aim and object of geological investigations.



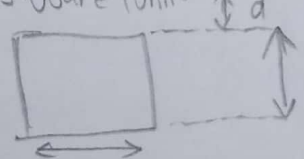
# (c) Selection of Design for the tunnels.

The ultimate dimensions and design parameters of a proposed tunnel are controlled, besides the factor by geological constitution of area along the alignment. whether the tunnel is to be circular, D-shaped, horse shoe shaped or rectangular or combination of one or more of these outline is more often dictated by the geology of the alignment than by any other single factor. D-shape or horse-shoe shape may be conveniently adopted but these shapes would be practically unsuitable in soft ground or even in even weak rocks with unequal lateral pressure. In those cases circular outline may be the first choice.

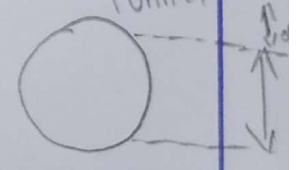
Horse Shoe Tunnel



Square Tunnel



Circular Tunnel



Semi-circular Tunnel



## d Assessment of Cost and stability

These aspects of the tunneling projects are also closely interlinked with the first three considerations.

Since geological investigations will determine the line of actual excavation the method of excavation and the dimensions of excavation as also the supporting system (lining) of the excavation, all estimates about the cost of the project would depend on the geological details.

## e) Assessment of Environmental Hazards

The process of tunneling, whether through rock or through soft ground, and for what so ever purpose. Purpose involves disturbing the environment of an area in more than one way. The tunneling methods might involve vibrations induced through blasting or ground cutting and drilling producing abnormal quantities of dust and last but not the <sup>least</sup>, interference with water supply system of the nearby areas.