***NAME: MUHAMMAD UZAIR KHAN***

***ID: 16703***

***SUBJECT: ENGINEERING GEOLOGY***

***DATE: 25/06/2020***

1. ***Q1:-******What causes earthquakes? If the Richter magnitude reaches at 8 or above what will be the consequences? Differentiate primary and secondary waves?***
* *An*[*earthquake*](http://earthquake.usgs.gov/learn/glossary/?term=earthquake)*is caused by a sudden*[*slip*](http://earthquake.usgs.gov/learn/glossary/?term=slip)*on a*[*fault*](http://earthquake.usgs.gov/learn/glossary/?term=fault)*. The*[*tectonic plates*](http://earthquake.usgs.gov/learn/glossary/?term=tectonic%20plates)*are always slowly moving, but they get stuck at their edges due to friction. When the*[*stress*](http://earthquake.usgs.gov/learn/glossary/?term=stress)*on the edge overcomes the friction, there is an earthquake that releases energy in waves that travel through the earth's crust and cause the shaking that we feel.*
* *Earthquakes are caused by faulting, a sudden lateral or vertical movement of rock along a rupture (break) surface.*

*If the Richter scale magnitude reaches to 8 or above than it can damage everything on earth because no building have the capacity to face 8 magnitude or above ,this is why great damage will cause .*

***DIFFERNTIATION BETWEEN PRIMARY WAVES AND SECONDRY WAVES:-***

***PRIMARY WAVES:-***

*Primary waves travel faster, move in a push-pull pattern, travel through solids, liquids and gases, and cause less damage due to their smaller size.*

*P waves travel at speeds between 1 and 14 km per second.*

*Primary waves are made up of compression waves, also known as push-pull waves.*

***SECONDRY WAVES:-***

*Secondary waves travel slower, move in an up-and-down pattern, travel only through solids, and cause more damage due to their greater size.*

*The S waves travel significantly slower, between 1 and 8 km per second.*

*S waves are transverse waves, which means they vibrate up and down, perpendicular to the motion of the wave as they travel.*

*In an S wave, particles travel up and down and the wave moves forward, like the image of a sine wave.*

 ***---------------------------------------------------------------------------***

***Q2:-***

***Dams:***

* *Dam’s structure built across a stream a river or an estuary to retain water. Dams are built to provide water for human consumption for irrigating arid and semiarid lands or for use in industrial process. They are used to increase the amount of water for generating hydroelectric power and to reduce floods .Many dams are used for many purposes for example, water in a single reservoir can be used for fishing, electricity and many other uses, this type of dam is called multipurpose dam.*
* *dams are the barriers which are constructed across rivers valleys to store water. they are built mainly to control floods for irrigating lands, for generating electricity and for supply water for industries and cites. A dam that serves more than one purpose is called multipurpose dam.*

*There many types of dam which are as follows:*

*1; earth dam*

*2: arch dam*

*3: gravity dam*

*4: buttress dam*

*1****: EARTH DAM;***

*The earth dams are constructed mainly by soil or earth. These dams can be built on earth or poor rock conditions.*

***2; ARCH DAM:***

*It is an arch shaped structure of single concrete wall. The convex side of which faces upstream.*

*The arch dam transmits the forces to the abutments by the arch action. Very strong abutment rocks are required for constructing arch dams.*

***3: GRAVITY DAM****:*

*It is massive structure of concrete or masonry which stands by its own weight. Generally sound foundation rock is required for the construction of gravity dams.*

***4: BUTTRESS DAM:***

*In this type of dam buttress are constructed at the downstream side to support an upstream deck of reinforced concrete. The buttress dams are usually constructed on good foundation rock.*

***Terminology:***

***Heel of a dam:***

*The portion of a dam that touches on the upstream side is called heel of a dam.*

***Toe of a dam:***

*The portion of a dam that touches the ground on the downstream side is called toe of a damn.*

***Axis of a dam:***

*It is an imaginary line that passes along the length of a dam through its center.*

***Abutments:***

*The sloping side of a valley upon which the sides of a dam are keyed are called abutments*

***Rules of geological selection of site for dams and reservoirs:***

*Geology have most rules for selection of sites for dams and reservoirs. There are many places varying and changes with passage of time, due to temperature changes the dam and reservoirs and damage before starting of any project of dam and reservoir. Geologist get full knowledge about that built up area after geological survey, they can decide that site is good or best for construction of dams.*

*Geology of reservoirs:*

*The artificial lakes which are created due to construction of dams across rivers are called reservoirs.*

*A reservoir may fail either due to excessive leakage or as a result of rapid sedimentation. Therefore the geological investigation of a reservoir area includes mainly the following factors:*

*1: study of ground water conditions*

*2: study of permeability of rocks*

*3: study of rate sitting*

 *---------------------------------------------------------------------------*

***Q3:-***

***There are 7 types of mass wasting***

*1: creep*

*2: Debris slides*

*3: Debris fall*

*4: flow*

*5: slumps*

*6: solifluction*

*7: mudflow*

***1: Creep:***

*A slow, gradual movement of soil or regolith downhill over time is called****creep.****Velocities are typically less than a centimeter per year. Freezing and thawing contribute to soil creep by progressively moving soil particles down the hill. Creep is manifested at the surface by such things as tilted utility poles that become more out of alignment every year. Vegetation helps reduce the rate of soil creep.*

***2: Debris flows:***

***Debris flows****are defined as mass‐wasting events in which turbulence occurs throughout the mass. Varieties of these are called earthflows, mudflows, and debris avalanches. The deadliest variety of debris flow is the****Debris avalanche, a****rapidly churning mass of rock debris, soil, water, and air that races down very steep slopes.*

***3: Solifluction:-***

*A variety of earthflow called****solifluction****is the flow of water saturated earth material over an impermeable surface such as permafrost. It occurs frequently in bitterly cold regions such as in Alaska or Canada.*

*Solifluction can occur on even the gentlest of slopes. Not forceful enough to break apart the surface vegetation, the migrating material drags it along like a wrinkled green rug. The soil finally settles on level ground at the base.*

*4:* ***Mudflow:***

*A****mudflow****is a liquidy mass of soil, rock debris, and water that moves quickly down a well‐defined channel. Generally viscous and muddy colored, it can be powerful enough to* ***move*** *large automobiles and buildings. Mudflows occur most often in mountainous semiarid environments with sparse vegetation and are triggered by heavy rainfall that saturates the loose soil and sediment.  A mudflow originating on a volcanic slope is called a****lahar.***

***5: Slump:***

*Earth material that has moved as a unit along a curved surface is called****slump.****A slumped mass of sediment is typically clay rich. Slump usually results when the geometrical stability of a slope is compromised by the undercutting of its base, such as by wave action, a meandering river, or construction.*

***Landslides protection:***

*There are also various direct methods of preventing landslides, these include modifying slope geometry, using chemical agents to reinforce slope material, installing structures such as piles and retaining walls, grouting rock joints and fissures, diverting debris pathways, and rerouting surface and underwater drainage.*

 *--------------------------------------------------------------------*

 *Q4:-* :

 ***FAULTS:***

A fault is a fracture along which there has been relative displacement of beds, which were once continuous. The fracture surface is called fault plane.

***JOINTS***: Joints are cracks or fracture present in the rocks along which there has been no displacement, rocks , vertical, inclined, or even horizontal there dip and strikes are measured in the same way as that of sedimentary strata.

***FOLD***:

 Folds the wavy undulations in the rock become are called folds. They consist of arches and troughs in alternate manner. The size of folds vary greatly. Width of some folds are, measured is kilometers while those of other in meters or centimeters.

***NORMAL FAULT***:

A normal fault is one in which hanging wall appears to have mood downward relative to footwall.

***FOLDS DEVELOP:***

 Folds developed in the following types of rocks, sedimentary rocks, metamophic rocks.

***EFFECT OF FAULTS ON OUTCROP:***

EFFECT OF DIP FAULTS: The effect of the dip fault is to cause a literal displacement in the outcrops. The amount of displacement becomes less with increase in the dip of rocks, and in vertical strata the displacement of the outcrop will be nil.

***EFFECT OF STRIKE FAULTS:***

 The effect of the strike fault is either to cause a repetition of the outcrops of the bed, or to eliminate the outcrops of some of the beds all together. Repetition of the outcrops occur when a strike fault hades in the opposite direction to the dip of strata. Omission of the outcrop of a bed may occur when strike fault hades in the same direction as the dip of strata.

***Last part D:-***

On a fold strata but also possible on all scenarios.

 *--------------------------------------------------------------------------*

***Q5:-***

***Tunneling:***

* *Tunnels and underground excavations, horizontal underground passageway produced by excavation or occasionally by nature's action in dissolving a soluble rock, such as limestone. A vertical opening is usually called a shaft.*
* *The underground routes or passage driven to the ground without disturbing the overlying soil or rock cover.*

***GEOLOGICAL INVESTIGATION FOR TUNNEL:-***

*Following investigation are use while tunneling.*

###  *1:- 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 and around different alternatives: the alignment having least geologically negative factors would be the obvious choice.*

### *2:-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.*

***3:-Selection of Design for the Tunnel:***

*The ultimate dimensions and design parameters of a proposed tunnel are controlled, besides other factors, by geological constitution of the 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 outlines, is more often dictated by the geology of the alignment than by any other single factor.*

### *4:-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.*

### *Assessment of Environmental Hazards:*

*The process of tunneling, whether through rocks or through soft ground, and for whatsoever 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 least, interference with water supply system of the nearby areas.*

 *-----------------------------THE END------------------------------*