Midterm Paper

(Summer)

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Subject # Engineering Geology

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Q No 01

a) Define Engineering Geology and write down any five branches of geology.

Ans **Engineering Geology :-** Engineering geology is the application of geology data, techniques and Principles to the study of rock and soil surficial materials and ground water.

→ This is essential for the proper location, Planning design, construction, operation and maintenance of engineering structures such as dams, tunnels bridges and buildings.

Five branches of geology.

1. **stratigraphy :-** The study of description and classification of strata sedimentary rocks.

2. **Mineralogy :-** The study of mineral composition, structure, apperance and occurance.

3. Physical Geology :- The study of natural Processes that modify the earth's surface.

4. Structural Geology :- The study of rock structures in earth's crust.

5. Paleontology :- The study of fossils in rocks.

(b) What was the objection on gaseous tidal theory?

Ans Gaseous tidal theory :- Jeans and Jaffrey proposed the theory in 1925.

- large star come near the sun due to gravitational pull a gaseous tide was raised on the surface of the sun.
- As the star come nearer, the tide increased in size.
- Gaseous tide detached when star move away.
- The shape of the tide was like spindle.
- It broke into pieces - forming

nine Planets of the Solar system.

objections

* The passing star is useable to import the proper angular momentum to detached geseous masser.

* The hot gaseous mass pulled away from the sun would not from solid planets but would dissipate into space.

c) Draw the interior of earth along with labeling. Also explain each labeling in details. ?

Ans

Interior of Earth

To the engineer interested in earthquake effects, the earth is a sptere having the layered structure of a boiled egg. It is a crust (the shell) a mantle (the egg white) and a core (the yolk

layer of the earth

* It is important to note that there has been, so for, no drill

that has Penetrated the surface of the earth more than a few kilometer.

* Almost all information about the interal structure of the earth is inferred from observed characteristics and propogation (travel rates and reflection) of seismic waves.

* Magnetic and gravitational obserations also help to complete the piture

The earth is divided into three main layer. crust, mantle and core.

* The core is composed mostly of iron (Fe) and is so hot that the outer core is molten, with about 10% sulphur (S). The inner core is under such extreme Pressure that it remain solid.

* Most of the earth earth mass is in the mantle, which is composed of iron (Fe) magnesium (Mg), aluminum (Al) silicon (S) and oxygen (O) silicate component. At over 1000 degrees C or 10°C, the mantle is solid but can deform slowly in plaste manner.

The crust

* The crust is much thinner than any of the other layyers and is composed of the least dense calcium (Ca) and sodium (Na)

alamium - silicate mineral Being relatively cold, the crust is rdcly and brittle so it can fracture in earthquaths.

* The shell of the earth, the crust can be said to have two different thickness.

* Under the occeans, it is relatively thin. it varies in thickness from 5 to 8 Km under the land masses it is relatively thick. The thickness of the continental crust various from to to 65 Km.

* If is paper the compared with the radius of the earth which is approximately 6400 Km.

* The total weight of continental crust is less that 0.3 % of the weight of the earth.

* Variations in the crust thickness are compensated by the weight of the water and the different in the specific gravities of the crust under the ~~occur~~ oceans (3 to 3.1) and under the continents (2.7 to 2.8).

* The weight of crust pulus the mantle has a reasonably uniform distribution over the globe.

The Mantle

The mantle have three different layer. The seperation is made because of different deformational properties in the mantle inferred (derived) from seismic wave measurements.

1. The upper layer is stiff. if the entire mantle had been as stiff, the outer shell of the earth would have been static. This stiff layer of the mantle and the over lying crust are referred to as the lithosphere. The lithosphere is approximately 80 km thick.

2. Beneath the lithosphere is a soft layer of mantle called as thenosphere its thickness is several times that of the lithosphere

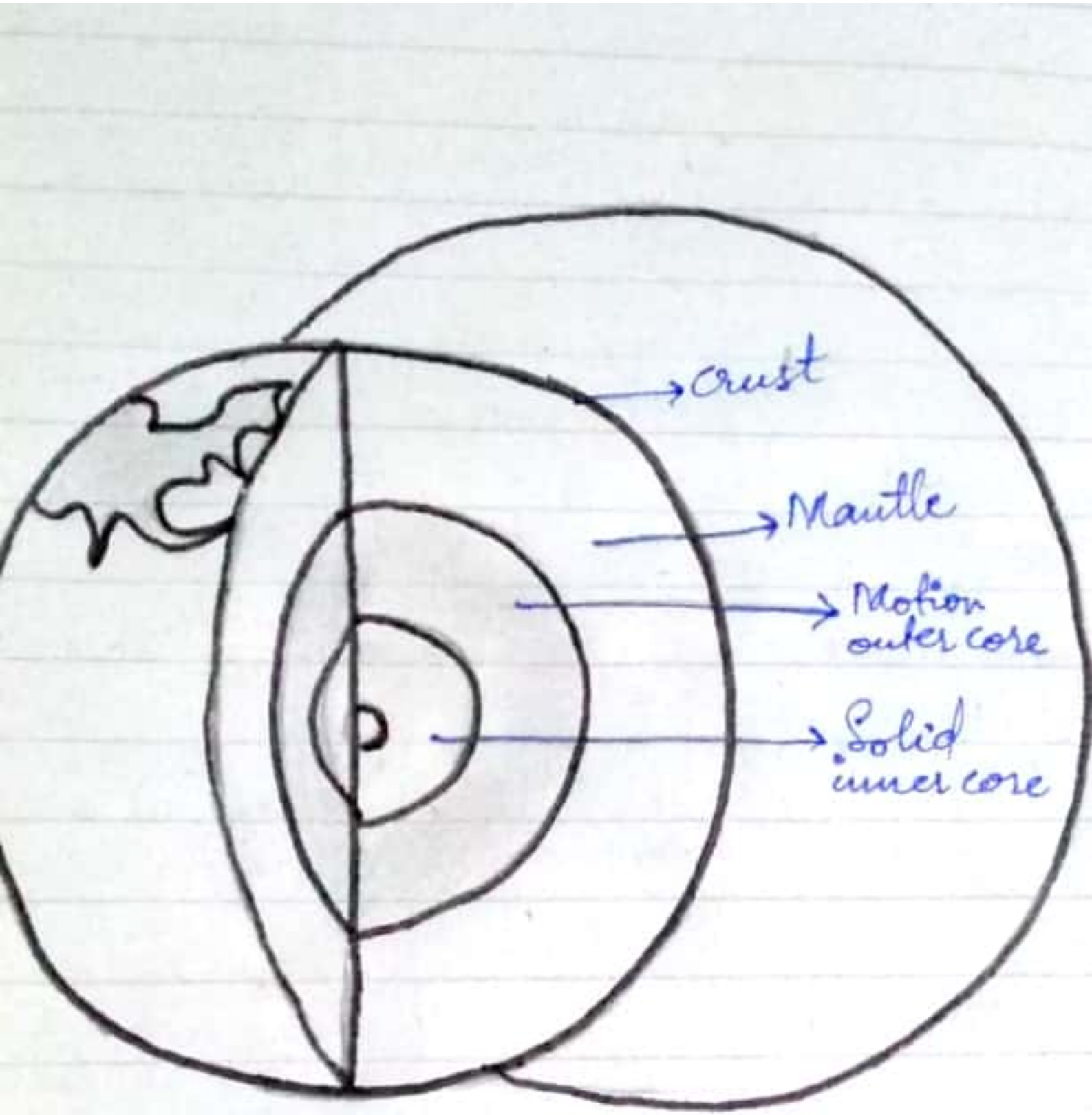
3. The mesosphere is the lowest layer of the mantle. The thickness and material properties of the mesosphere are not well known. It is expected to have a stiffness somewhere between those of the lithosphere and the asthemosphere.

The core

* At a depth of approximately 2900km there is a large reduction can the order of 40% in the measured velocity of seismic waves. The boundry between the mantle and the core is assumed to be at the depth.

* The 2300 km thick outer layer which is in a molten state and an 1100km thickness inner layer which is solid.

* It is known that the pressure increase toward the center of the earth so does the temperatur the liquired outer layer varsus the solid inner layer is rationelized by recongnizing that the melting point of the metrial increases (with pressure) at a faster rate than the temperature as the center of the earth is approached.



(d) Mohs scale of hardness

Minerals	Hardness	common test.
Diamond	10	Not scratched by Knife
Corundum	9	
To Paij	8	
Quartz	7	scarcely scratched by Knife
Feldspar	6	
Apatite	5	scratched by Knife
Flurite	4	
Calcite	3	
Gypsum	2	scratched by Tiger nail.
Talc	1	

which minerals were used as a standard of comparison.

* The hardness of a mineral, as commonly determined on fresh material is measured by it ability to resist scratching. if mineral is scratched by a knife, it is softer than the knife it cannot be scratched by a knife, the two are equall, hardness of the mineral is the harder.

* In order to have a standard method of expressing hardness of minerals a simple scale, known

as the mohs scale has been universally adopted.

* In sequence of increasing hardness from 1 to 10, the following minerals are used as standard of comparision.

Q No 02

a) **Chemical weathering:** it is the breakdown of rocks and minerals into smaller Pieces by chemical action. The rocks breaks down at the same time as it change chemical composition. During chemical ~~wea~~ weathering rocks are broken down in a process called decomposition Acid rain and pollution are two factors of chemical weathering that causes the most damage.

b) **Mechanical Exfoliation**

It is the Peeling off the sheets of rocks as they expand and crack. During the day when the sun is out, rocks becomes hotter and expand. During the night when the

is no longer out, the rock will become cooler and contract. This continous process of heating and cooling causes small pieces of the of rocks.

(c) Write down the factors that influence the rate of sediment depostion?

Ans There are four factors that influence the rate of sediment deposition.

(1) Sediment size

(2) Sediment shape

(3) Sediment density

(4) Sediment velocity

d) Find out which cube will have more rate of weathering and why?

one cube	2nd cube
4 cm = ?	2 cm = ?
4 cm = ?	2 cm = ?

Ans

one

$4\,cm \times 4\,cm = 16\,cm^2$

$16\,cm^2 \times 6$ side $= 96\,cm^2$

The surface area $= 96\,cm^2$

2nd

$2\,cm \times 2\,cm = 4\,cm^2$

$4\,cm^2 \times 6$ sides $= 24\,cm^2$

$24\,cm^2 \times 8$ cubes $= 192\,cm^2$

The surface area $= 192\,cm^2$

More surface area exposed higher will be the rate of weathering, as the rock is in small Pieces i.e 8 cubes (2cm x 2cm) with surface area $192\,cm^2$.

So the area of smaller rocks is more therefore rate of weathering of smaller rocks will be higher as compared to the area of single rock (4cm x 4cm) with surface area $96\,cm^2$.