FUNDAMENTAL OF ELECTRICAL AND ELECTRONIC ENGG

24/04/2024

Construction Materials

Unit No 1 → Natural construction on material.

Unit No 2 → Artificial construction on Materials

Unit No 3 → Prestressed construction on materials

Unit No 4 → Special construction on material

Unit No. 1 (Natural construction on material)

(ii) Identify rocks based on geology of it origin :→

or Geological classification of rock :→

- Igneous rock
  - Volcanic rock
  - Hypabysal rock
  - Plutonic rock
- Sedimentary rock
- Metamorphic rock

(1) IGNEOUS ROCK :→

LA A type of rock formed by the process of cooling and crystallization of hot molten material such as magma or lava is known a "IGNEOUS ROCK".

NOTE :- (i) Magma and lava :→
The hot molten material occuring naturally below the earth surface is known as "Magma"
when magma is erupted through the volcanoes then it is known as lava.

(ii) Igneous rocks are formed both from magma and lava.

(iii) It may be noticed that magma is hypothetical melt. It is not possible to find the exact position for the occurence of magma. But it is assumed that it is situated very deep inside the earth surface.

(2) SEDIMENTRY ROCK :→

☆ Sediments :→
The sediments may be defined as the particles provid

produce by decay and weathering of pre existing rock.
or in other word sediments may be defined as the particles produce by dead remains of plants and animals etc. in suitable environment.

Sedimentry rock :->

A types of rock developed by the accumulation and compaction of sediments is known as sedimentry rock.
Sedimentry rock is also known as secondary rock.

METAMORPHIC ROCK :->

These rocks are formed by change in character of the pre existing rock.
The igneous rock and sedimentry rock are changed in character when they are subjected to great heat and pressure. The process of change of is known as "Metamorphism".

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Types of Igneous rock :->

(1) Volcanis rock (ज्वालामुखी) :->
Volcanic rock are the igneous rock formed on the surface of earth by cooling and crystallization

of lava erupted from volcanoes.
for eg :- Basalt.

② Hypabysal rock :→

Hypabysal rock are the igneous rock formed at the intermediate depth generally upto 2km below the surface of earth and exb exhibit mixed characteristics of volcanic and plutonic rock.
for pro porphyries.

③ Plutonic rock :-

plutonic rocks are the igneous rock formed at the considerable depth generally (7 to 10) km below the surface of earth.
for eg :- Granites

Ques Explain the geological classification of rock.

✱ Requirment of a good bulding stone:-

(1) It should be strong
(2) It should be hard.
(3) It should be tough.
(4) It should be durable
(5) It should resist the chemical attack (Size and Shape)
(6) It should be properly dressed.
(7) It's Crushing strength is 1000 kg/cm².

(g) It's specific gravity is 2.11.
(h) It's water absorption tendency is low.

Ques Explain the characteristics of stone.
"or"
Write down the requirement of a good building stone. (2 marks)

Quarrying of stone :→

The process of taking out the stones from the natural rock bed is known as "Quarrying of stone".
The term 'quarry' is used to indicate the expose surface of rock. The quarrying operation may either be carried out by the hand tools or with the help of explosives. (2 marks)

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(11) Site selection for the Quarry of stone :-

The selection of site for a quarry of stone should be done after studying the following aspect :→

(i) Availability of tools, power and labours are easily available.

(ii) The site for the quarry is easily accessible to roads, railway, ~~seacost~~ seacoast etc.

(iii) Good quality and quantity of stone should be obtained from the proposed quarry site.

(iv) Easy availability of clean water in sufficient quantity all the year around

(v) facility of carrying and conveying stone from quarry.

(vi) Geological data regarding rock formation at the site.

II SAND :-

↳ The sand particles consists of small grain of silica (SiO_2).

↳ It is formed by the decomposition of sandstones due to various effect of weather

↳ According to the natural sources from which the sand is obtained, it is of the following three types:

1. Pit sand
2. River sand
3. Sea sand

PIT SAND :→

↳ This sand is found as deposits in soil and it is obtained by forming pits into the soil.

→ It is excavated from a depth of about 1m to 2m from ground level.

→ The pit sand the consist of sharp angular grain which are free from salts and it proves to be excellent material for mortar or concrete work.

RIVER SAND :—

↳ This sand is obtained from banks or bed of rivers.

↳ The river sand consists of fine rounded grain.

↳ The colour of river sand is almost white.

↔ As the river sand is usually available in clean condition, it is widely used for all purposes.

(11) SEA SAND :-

↳ This sand is obtained from sea shore.

↳ The sea sand, like river sand, consists of fine rounded grain.

↳ The colour of sea sand is light brown.

↳ The sea sand contains salts.

↳ These salts attract moisture (नमी) from the atmosphere (वातावरण).

↳ Such absorption causes dampness, efflorescence and disintegration of work.

↳ Due to all such reasons, it is the general rule to avoid the use of sea sand for engineering purpose.

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CLASSIFICATION OF SAND :-

According to the size of grain. The sand is classified into three categories :-

1 Fine Sand :-

The sand passing through a screen with clear openings of 1.5875mm is known as fine sand.

(ii) Coarse Sand :→

The sand passing through a screen with clear opening of 2.175mm is known as "Coarse sand".

(iii) Gravelly Sand :→

The sand passing through a screen with clear opening of 7.62mm is known as "Gravelly Sand".

NOTE :→

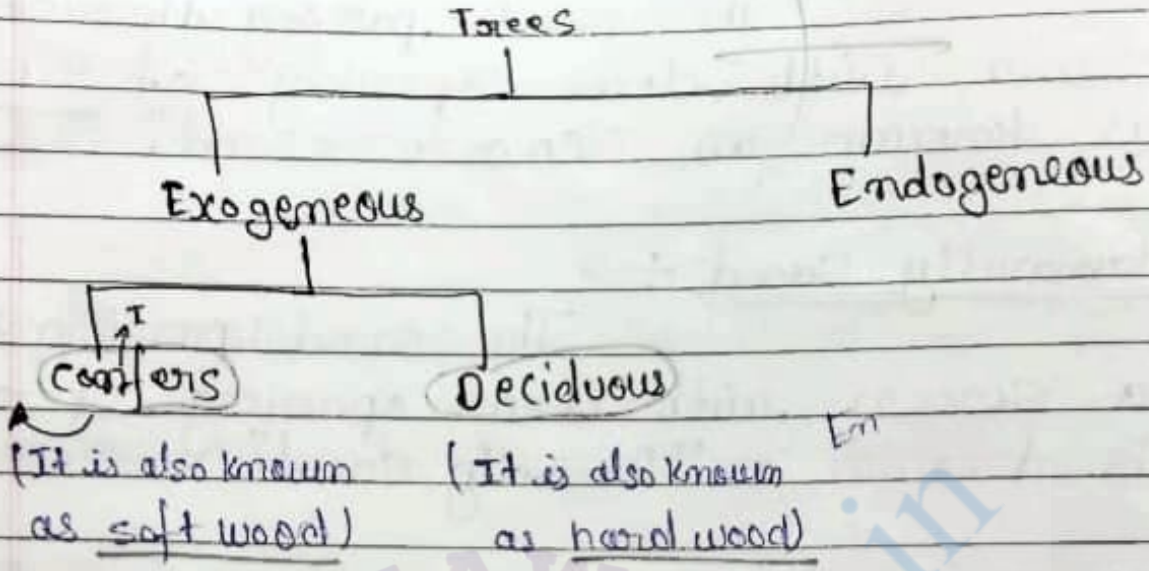
* Fine sand is mainly used for plastering.
* Coarse sand is mainly used for masonry work.
* Gravelly sand is mainly used for concrete work.

Mortar :→ It is mixture of binding material such as cement; fine aggregates such as sand along with suitable proportion of water, known as Mortar.

Concrete :→

It is the mixture of binding material such as cement; fine aggregates such as sand; coarse aggregate such as stone chips along with suitable proportion of water, is known as concrete.

TIMBER :-



Exogeneous trees :-

These trees increase in bulk by growing and distinct consecutive rings are formed in the horizontal section of such a tree.

The timber which is mostly used for engineering purpose belong to this category.

Endogeneous tree :-

These tree grow in wards and fibrous mass is seen in their longitudinal section.

The example of endogeneous trees are bamboo, cane, palm etc.

CONIFERS :-

1. Conifers trees are also known as Evergreen trees.

- Leaves of these trees do not fall till the new leaves are grown.

- Since the fruits of these trees apper in cone shaped. So, it is also known as ~~known~~ "Conifers"

- Example of coniferse trees are chir deodar, fir, Pine, Cypress etc.

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DECIDUOUS :-

- Deciduous trees are also known as broad leaf trees.

- Leaves of these tree fall in al autumn an new leaves born in spring season.

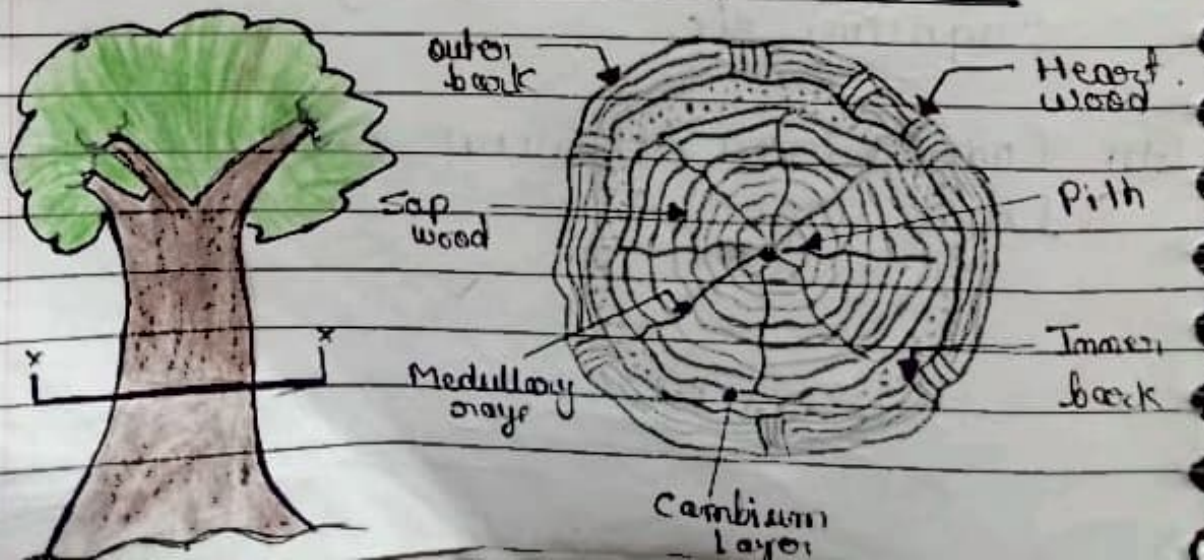
- The timber for engineering purpas is mostly derived from deciduous.

- Examples of deciduous trees are oak, teak, sal, babul, mohagany, shishum sagwan etc.

(ii) Comparison between soft wood and hard wood :-

Item	soft wood	Hard wood
(i) Annual ring	Distinct	Indistinct
(ii) Colour	Light	Dark
(iii) Density	Low	High
(iv) weight	light	Heavy
(v) source	conifers trees	Deciduous
(vi) Fire resist.	poor	More
(vii) Example	chir, deodar, fir pine cypress etc.	oak, sal, teak shisham saguan etc.
(viii) shape of leafe	conifers trees with needle shaped leaves.	Deciduous trees with flat (pattay) broad leaves.

(iii) CROSS-SECTION OF AN EXOGENOUS TREE :-



(i) PITH :- The inner most central portion or core of the tree is called pith or medulla.

It nourishes the plant in it young age.

(ii) HEART WOOD :-

- The inner annual rings surrounding the pith consitute the heart wood.
- It is usually dark in colour.
- As a matter of fact, it indicates the dead portion of trees. But it imparts rigidity to the trees.
- Hence it provides strong and durable timber for various engineering purpose.

SAP WOOD :-

- The outer annual ring between hart wood and cambium layer is known as the "sape wood."
- It is usually light in colour and weight.
- It indicates recent growth and it contain sap.
- The sap wood is also termed as "alburnum"

4 CAMBIUM LAYER :-

The thin layer of sap between the sap wood and inner bark is known as the cambium layer.

If the bark is removed for any reason, the cambium layer gets exposed (खुला होना) and the cells cease (रुक जाना) to be active resulting in the death of tree.

5. INNER BARK :-

The inner skin or layer covering the cambium layer is known as inner bark.

It gives protection to the cambium layer from any injury.

6. OUTER BARK :-

The outer skin or cover of the tree is known as the outer bark.

It is the outermost protective layer and it contains cracks and fissures.

7. Medullary rays :-

The thin radial fibres extending from pith to cambium layer are known as medullary rays.

The function of these rays is to hold together the angular

rings of heart wood and sap wood

(11) PROPERTIES OR A good characteristics or Quality of a Timber Timber :→

1 APPEAREANCE :

A freshly cut surface of timber should exhibit hard and shining appearance. (दिखाई)

2. COLOUR :- The colour of timber should preferably dark.

3. DEFECTS :- A good timber should be free from serious defects.

4. DURABILITY :→ A good timber should be durable.

5. ELASTICITY :→ This is the property by which the timber returns to its original shape when load causing is deformation is removed.

(दिखाई)

(6) FIBRES :- The timber should have straight fibres.

(7) FIRE RESISTANCE :- The timber is a bad conductor of heat. A dense wood offers good resistance to the fire and it requires sufficient heat to cause flame.

8. **HARDNESS :-** A good timber should be hard i.e it should offers resistance when it is being penetrated by another body.

9. **Smell :-**
A good timber should have An unpleasant smell indicates (गंध)

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(ii) Asphalt :-
Asphalt is a solid or semi solid product left behind during the distilation of petroleum.
In composition, it is actually a mixture of bitumen (डामर) and certain inert material like silica, alumina and lime.
As such it is only partly soluble in carbon disulphide.

(1) CHARACTRISTICS OR PROPERTIES OF ASPHALT :-

1. It has brownish black colour.
2. It is solid or semi solid material.
3. It is moderately elastic.
4. It is partly soluble in carbon disulphide.
5. It does not absorb water.
6. It has resistance to acids.

⑦ It is soft, plastic and workable when heated.
⑧ It has high binding power.
⑨ It is good insulator for heat, electricity and sound.
⑩ It is never hard and brittle.

(11) USES OR APPLICATION OF ASPHALT :-

① It is mainly used for the construction of a flexible pavement i.e Bituminous pavement.

② It is used for the lining or bitching of the swimming pool and the other water tank.

③ It is used as water proof cover for the roof.

④ It is also used in the preparation of paint.

(12) METHODS OF DETERIORATION OF STONES :-

Deterioration of stones means splitting out of stones into pieces. Here we are discussing some natural methods for the deterioration of stones :-

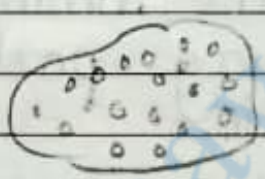
(i) RAINFALL :- Rain Heavy Rainfall is

Capable for the splitting out of stones into pieces.

(ii) WIND :- Heavy blown air is also capable for the splitting out of stones into pieces.

(iii) TEMPERATURE CHANGES :-> High temperature and low temperature is also capable for the splitting out of the stones.

(iv) Frost action :->



cold weather.

If the stone containing certain voids these voids collect water. Under the cold weather condition these water converted in ice. These ice now apply tensile force around its surrounding which tends to cause cracks in stone. And these cracks finally leads to splitting out of stones.

(b) Quarrying - METHODS of quarrying of stones :-

(1) DIGGING :- This method is used the quarry consist of small and

soft pieces of stones.

② HEATING :→

This method is used when the natural rock bed is horizontal and small in thickness.

③ WEDGING :→

The process of exp extraction of stone by the application of highly advanced equipment ; is known as wedging.

This method is used when the hard rock consist of natural fissures.

METHODS OF PRESERVATION OF STONES :→

(i) Coating the surface of dry stone with paraffin wax, linseed oil or light paint.

NOTE : However this treatment is not permanent.

(ii) washing the stone surface frequently with water and steam removes the deposited dirts and salts.

(H) Classification of coarse aggregate on the basis of size :→

ISSCS → Indian standard soil classification system.

(75 μ to 24)

Boulder, Cobble Gravel sand silt cla

> 300mm (80 to 300)mm (4.75 to 75 μ) < 24 μ

Coarse aggregate

1 μ = 1 micron = 10^{-3}

75 μ = 75×10^{-3} mm = $75 \times \frac{1}{1000}$ = 0.075

(H) USE OF BAMBOO IN CONSTRUCTION :→

(i) Bamboo can be utilized in making the scaffolding (H-frame).

(ii) Bamboo can also be utilized in making the shuttering (Horizontally support.

(iii) Bamboo can be also be utilized in making bridges.

(iv) Bamboo can also be utilized as a beam.

(v) Bamboo can be also be utilized as a roofing material.

(vi) Bamboo can be also be utilized as a partition wall.

(II) PROPERTIES OF SAND AND ITS USES :→

PROPERTIES :-

(i) The size of the sand lies between 4.75mm to 75μ

(ii) The sand particles consists of small grains of silica (SiO_2)

(iii) Sand is highly sensitive to moisture

(iv) Sand having the tendency to absorb the moisture even nearby the surrounding and tends to increase it's volume, which is known is known as Bulking of sand.

(v) Sand should free from kankar.

The particles of sand having the good appearances.

(II) USES :→

(i) Sand is utilized in making motar.
(ii) Sand is utilized in making concreate