

Engineering is a profession in which knowledge of mathematics and natural sciences is gained by studying experience, practice and is applied with judgement to develop several ways to utilize the resources economically, socially and beneficially for the mankind.

* Civil Engineering : It is the oldest branch of engineering which involves no. of operation such as surveying, planning, analysis, design estimate, execution of work and maintaining of its structure for its lifetime.

* Branches of civil engineering

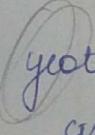
- ① Structural Engineering
- ② Geotechnical
- ③ Transportation
- ④ Environmental
- ⑤ Water Resource

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* Scope of various branches of civil engineering

- ① Structural : is a branch of civil Engg. having the wide variety of structural systems like building, bridges, dams etc. the various scopes are :

- ① Structural Engg. plays a major role in planning, designing and building a structure.
- ② the Structural analysis and structural design are the components of structural engg.
- ③ the S.E. is responsible for creaⁿ of structural system according to the needs of clients and architects.
- ④ S.E. plays a imp. role to build industrial prod. and manufacturing unit
- ⑤ S.E. should take the responsibility towards safety and serviceability of the building.
- ⑥ S.E. should introduce new technologies and material equipments for economic constructions.
- ⑦ the S.E. are involved in analysis and design of research and development which is a vital role for the improved version of technologies.
- ⑧ the S.E. should be prepared to accept natural calamities such as earthquakes, landslides, wind forces etc and should provide remedial measures.
- ⑨ the advent of electronic digital computer has completely revolutionized the planning, analysis and design of the structures with the help of various software.

 * Geotechnical Engg: It is one of the youngest branch of civil engg which deals with property and behaviour of the earth's material (soil).

- 3) Scope of Geotechnical Engg: It refers to all the engineering prob. involving soil and rock as a foundan material and construct material.
- 4) It is concerned with properties of earthen materials.
- 5) To investigate the soil, bed rock below the structure and study the soil structure interaction
- 6) To select the type of foundan for a particular structure
- * 7) To design foundan for buildings, dams, retaining walls, bridges, road pavements, railway lines, harbours etc.
- 8) To design foundan for under ground structure like tunnels, power houses, off shore structures.
- 7) To design foundan for machines such as turbine, compressors etc in order to vibration to the soil
- 8) To study the affect soil for blasts during mining, earthquakes, land slides and nuclear explosion.
- 9) To study about compaction, permeability, seepage, consolidation, stability, drainage and bearing capacity of soil to determine the type of foundan for a structure.

Transport Engg: It in Transport means movement of men and materials from one place to another.

The common modes of transport are

(i) road ways, (ii) rail ways, (iii) tram ways.

4) Water ways.

5) Air ways.

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Slope of Transport Engg:

- 1) It contributes to the ^{economic}, social, industrial and cultural development of any country.
- 2) For economic development of any region the transport system is very much essential.
- 3) To promote public transport and mass transport facilities.
- 4) Provide co-ordination among various modes of transport which improve service level and quality.
- 5) To optimise the transport cost, maintenance costs and administrative overheads.
- 6) Planning the transport process w.r.t. survey and analysis of existing condition and forecasting the future condition.
- 7) Evaluating the alternatives using cost benefit ratio techniques.
- 8) It involves accident study for safe and comfort transport system.
- 9) It involves geometric or shape and size design, material study, form design, construction and maintenance.
- 10) For good traffic performance and control.

Environmental Engg : it is a multidisciplinary science involving the app. of engg. principles, protection & enhancement of the quality of environment and to the enhancement and to the poster of public health and welfare.

Slope of Environmental Engg:

- 1) The importance of protection and conservation of the environment
- 2) The need to restrain human activities which lead to indiscriminate release of pollutants into the environment.
- 3) the provision of safe, palatable, ample public water supply with waste treatment facility.
- 4) Solution of problems of environmental sanitation with waste water treatment.
- 5) Proper disposal of waste water and solid waste
- 6) Adequate drainage of urban, rural and ~~recreational~~ areas recreational areas.
- 7) Control of air, water and noise pollution.
- 8) Control of soil and atmospheric pollution which can cause the social and environmental impacts
- 9) Elimination of industrial waste to let into the atmosphere
- 10) To study environmental impact assessment and mitigation measures.

Water Resource engg:-

1) Water is very imp natural resource for the developmⁿ of a country.

2) Proper conservaⁿ of use of water and land resources have an impact for social and economic development of country.

Scope of water resource engg:-

1) It facilitates to control, regulate and utilize water to serve wide variety of purposes.

2) It is the concern of economists, scientists, geologists, chemists to conserve water.

3) Flood mitigation, land drainage, sewage and highway culvert design.

4) It gives scope for utilization of water in beneficial purpose for providing water supply, irrigⁿ, hydro electric power development and navigation improvement.

5) ^{water quality management} Pollution control is the imp. phase of water resource engg.

6) ^{Reservoir} Preservⁿ of beauty and preservation of flora and fauna is the main scope of water resource engg.

7) To protect the aquatic life.

MATERIALS OF CONSTRUCTIONS

* properties of stones used for constructⁿ purpose.

→ They should possess fine grain texture and it should be free from cracks.

→ Shape of the stones should be uniform in nature.

- The stone should be hard, strong and durable.
- The stones should have resistance to chemical attack.
- It should not absorb more than 5% of water by weight when immersed in water for 24 hrs.
- The specific gravity of stone should not be less than 2.5.

* $\frac{\text{Weight of material}}{\text{Weight of water}} = \text{specific gravity}$

- It should be easily workable.
- The stones should near ^{more} than 2%.
- toughness index should be more than 19.

Uses of Stones:-

- Stone masonry is used for foundaⁿs, arches, columns etc.
- Stones are used for construction of high rises buildings, multistoreyed apartments, bridges, dams, canals, tunnels etc.
- Stones are also used for construction of road pavements.
- Stones are also used as ballast in railway tracks.
(transf railway load to earth).
- It is also used for construction of footpath, retaining walls.

Bricks:

Properties of good bricks:

- * Colour :- Brick should possess uniform colour.
- * Shape :- Brick should have plane rectangular shape?
the standard size of bricks are (190x90x90 mm without mortar)
(with mortar) the size of bricks are (200x100x100 mm).
- * Texture : It should have fine, dense & uniform texture.
- * Soundness :- Bricks should give metallic sound when struck with hammer or another brick.

* Strength :- Indian standard code does not permit use of any brick with crushing strength less than 3.5 N/mm^2 or 3.5 N/mm^2 .

* Water Absorption :- After immersing bricks in water for 24 hrs the water absorption should not be more than 20%.

* efflorescence :- Bricks should not show white patches when soaked in water for 24 hrs and then allowed to dry in shade (patches indicates presence of sulphates, magnesium, silica)

* Bricks should not break when dropped from the height of 1m from on the hard ground.

* Good quality of brick will have high resistance to fire.

Uses :

* Extensively used as building blocks.

* They can also be used for lining of ovens, furnaces and chimneys.

* Brick bats are used in mortar to provide weather proofing course to the RCC roof.

* fire protection, steel columns are provided by encasing them with the bricks.

* Bricks are also used for construction of manholes.

, sewage treatment plants, footpath etc.

Timber:

Properties of timber

- 1) Strength :- The good timber should possess high amount of strength.
- 2) Modulus of Elasticity :- It is defined as force per unit area and expressed as N/mm².
the timber should possess high Modulus of Elasticity.
- 3) Colour : the colour of the wood should be pleasant and uniform in appearance.
- 4) Odour : when freshly cut the timber will possess a pleasant odour.
- 5) Density : Timber which is used for construction purposes should possess high density and high amount of resistance to impact loads.
- 6) Texture : Typically good quality of timber will have fine ~~red~~ grained homogenous texture.

Uses:-

- 1) For m The timbers because of good strength it is used for construction of load bearing walls.
- 2) It is also used for light construction works such as doors, windows, flooring and roofing.
- 3) timbers can be used for construction of columns and ~~trusses~~ trusses.
- 4) Timber is also used for temporary constructions such as shuttering, scaffolding etc.

or
centring .

- ⑤ For industrial uses like manufacture of paper, cardboards, wall papers etc
- ⑥ For construction of agriculture equipments.

Concrete is the binding material used for construction and is a mixture of cement, sand and coarse aggregate. When water is added to the dry mixture of binding materials and the aggregates it forms a plastic mass which can be easily moulded to the desired shape & size. Depending upon binding materials used there are 3 types of concrete.

- 1) Lime concrete
- 2) Cement concrete
- 3) Polymer "

Properties of plain cement concrete (PCC)

- 1) Workability : Defined as ease with which concrete can be compacted fully without segregation and bleeding, bleeding.
- 2) Segregation : Separation of some coarser particles from the concrete is called as segregation.
- 3) Bleeding : This refers to oozing of extra water content which is present in the concrete.
- 4) Strength : The characteristic strength of concrete is defined as compressive strength of 150mm size cube after 28 days of curing below which not more than 5% of test results fail.

- 5) fineness : In order to obtain good strength of concrete the cement should have greater setting rate of fineness.
- 6) curing : In order to obtain the desired strength concrete should be cured for 28 days in a portable malle.
- 7) Resistance to wear and tear : A good concrete will have high rate of resistance to wear and ~~tear~~ ^{fat} in its hardened state.
- 8) Porosity : the concrete which are used for mall concrete works, should exhibit less amount of porosity.
- 9) Durability : the concrete when exposed to extreme weather conditⁿs then it should have high amount of resistance to the ~~effect~~ ^{effects} causing by it.

Uses:

- 1) Concrete is used for constructⁿ of foundanⁿ, columns, beams etc.
- 2) It is used for constructⁿ of air ways, road pavements etc.
- 3) Used for constructⁿ of sewage treatment plants.
- 4) Used for constructⁿ of multi storied buildings, apartments, high rises buildings.
- 5) It is also used for decorative and architectural constructⁿs.
- 6) Reinforce cement

Reinforced cement concrete (RCC) : It is a mixture of combination of reinforcing bars along with plain cement concrete. Since concrete is weak in tensile force and strong in compression so that the addiⁿ of steel bars will increase tensile strength of concrete.

Properties of RCC

- 1) It should be capable of resisting tensile, compressive & bending forces.
- 2) It should not show excessive deflection to spoil the serviceability of the structure.
- 3) The air cracks developed should be minimal means.
- 4) It should have high resistance to fire.
- 5) It should have high amount of durability.
- 6) " " take the load greater than the designed value without failure.

Uses of RCC

- 1) Used in (i) foundation, columns, beams, railway line as sleepers; electric poles, tunnels & harbours, highway pavements, architectural construction, tunnels and harbours.

Properties of tiles:

- 1) It should be free from any cracks and blemish.
- 2) It should have light weight.
- 3) " " regular in shape and size.
- 4) " " hard, durable and strong.
- 5) It should give a homogeneous, and compact structure when it is placed.
- 6) It should possess a uniform colour.

Uses of tiles:

Used in - flooring

- roofing

- wall decorative purposes.
- architectural purposes.
- broken tiles.

(ii) Broken tiles can also be used for the concrete as an

(vi) It is also used in lining of refractory for furnaces, chimneys etc.

Note:

- 1) Properties and uses of prestressed concrete (PSC)
- 2) Properties and uses of composite materials.

Properties:

- 1) Composite materials have lower density.
- 2) have higher fatigue endurance.
- 3) have higher strength than ceramics and glass.
- 4) higher directional mechanical properties.
- 5) they are easy to maintain.

Uses

- 1) Used in aircraft industries.
- 2) Used in manufacture of sports equipments.
- 3) in Orthopaedic surgery
- 4) Carbon composite is used in payload adapters of heat shields of launch vehicles.

Properties:

- 1) It should be able to withstand effects of external earth & traffic loads.
- 2) It should be able to withstand high internal pressure.
- 3) It should have high structural capacity & serviceability.
- 4) It should be highly efficient & durable for long time.

Notes:-

Uses:-

It is used in :-

1) high raised buildings

2) Foundation systems

3) Bridge & dam structures

4) Industrial pavements.