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Q1. Historical development of Geosynthetic in India:-

Historically, early civilization have used natural materials to improve soil behaviour. eg. ziggurats of Babylonia. Where in woven mats of reeds were used & tree branches were placed in great wall of China. In India it is common to see dry branches & leaves or trees being used to reinforce soft soil in which heavy trucks get bogged down in raining season. Textile materials was perhaps first used in salad const. in south Carolina in early 1930. Europe as well as USA later in 1969 non-woven fabrics were used as a filter in the upstream face of earthen dam.

In 1971, use of woven fabrics as reinforced for embankment constructed on very soft foundation was initiated. Today the use of such material is more common for a wide range of Civil Engg. applications.

The term which is proposed in 1983 by Professor Robert M. Koerner. Director of Geosynthetics Research Institute & now being increasingly used in Geosynthetics which encomposses

i) Geotextiles
ii) Geomembrane
iii) Geogrids
iv) GeoComposition.

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Q2. Functions of Geosynthetic material with refrence to their applications in Civil Engg:-

⇒ Functions of GeoSynthetic:-

1) Fluid transmission:- The geo-textiles can collect a liquid or a gas and convey it along its own plane, providing fluid transmission. This has been conventionally termed as drainage function.

ii) Filtration:- A Geotextiles act as a filter when it is normal to its own plane, while preventing from being carried away by the soil.

iii) Separation:- when placed b/w a fine soil & a coarse geotextiles prevents the coarse from moving under repeated loads.

iv) Protection:- A geotextile protect a material when it alleviate contribution & strains transmitted to the bitching material

i) for surface protection as in erosion.
ii) for interface protection, ie alleviation of reflection cracking.

⇒ Application of Geosynthetic:-

1. Internal-reinforcement retaining walls:- Geotextiles are geogrid in Internal reinforced soil walls along reinforcement of the soil mass, creating stable fill areas behind the wall face.

2. Step slope reinforcement:- Geotextiles and geogrids can allow construction of slope for steeper angle than permitted by the solid natural angle which allows for more efficient land use.

3. Subsurface drainage

4. Erosion control

5. Geomembrane - Protection:- Geotextile may be placed on one or both sides of the geomembrane to protect it from installation & design stresses.

☆3 Manufacturing of woven Geotextiles:- Starting from the polymer chips, the manufacture of geotextile accomplished in two steps.

i) Making linear elements as fibres & yarns.
ii) Combining these to make a planer structure designed as a fabric / geofabric / geotextile.

This involve various stages of production & is rather complex. The technology of producing a fabric from a polymer chip is rightly advance in some cases.

Fibres:- Fibres are characteristic by the following

i) High ratio of length to thickness (1000:1)
ii) Very fine dia (10 to 30 μ)
iii) Flexible in nature.
iv) Having high strength & low elongation.

v) Having good stability of sufficiently high temp.

Generally they are available in 3 different form,

i) Stable fibres
ii) Set fibres
iii) Filaments

Q 4.9 Differentiate b/w woven & Non woven Geotextiles:

Property	Woven	Non Woven
1. Fibre Arrangement	Orthagonal	Random
2. Properties	Directional	Non-directional
3. Breaking Elongation.	Higher	Lower
4. Initial Modulus	Higher	Lower
5. Tear Resistance	Low High	Higher
6. Openings	Can be regular	Irregular
7. Filtration	Single layer	Often Multi-layer
8. Porosity	35% - 45%	55% - 95%
9. Inplane flow	Low	Can be high
10. Edge	May Ravel	Doesn't Ravel

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Q46. Pull out test on Geogrids :-

Pull out test are typically performed to assess the anchorage or pull-out capacity of geosynthetics. This capacity is important in situations such as retaining walls, slopes & bridging over voids. Where the geosynthetic is anchored into stable ground that is outside of the ~~the~~ one failure.

The test is performed in an apparatus described by ASTM D6706. where the dimensions shown are mini. dimensions that may need to be increased depending on the structure of geosynthetic, particle size of a soil, & provisions for reducing side-wall friction. Normal stress confinements is provided by an air bag placed b/w the top of the soil & a reaction time.

The purpose of a sleeve is to reduce the amount of normal stress generated along the front wall of the box as a geosynthetic is a being pulled out. load horizontally displacement of the geosynthetic at several location along the material length.

The pull-out resistance or anchorage

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Capacity is calculated as a live load taken as the force necessary to cause full-out divided by the width of specimen. This force is typically used to compute an interaction coefficient, which is essentially the ratio of friction angle of geosynthetic. For long embedment length & large normal stress confinement, this may not case & the test must then be interpreted as a boundry.