PAGE NO. 4
DATE: 1/8/19

1. Introduction and Scope of Civil Engineering

1) Discuss the scope of civil Engineering.

⇒ The main scope of civil engineering is planning, designing, estimating, supervising construction, managing construction, execution and maintenance of structures.

The Scope of civil engineering is two field:

(i) According to field of work, area of services & type of structure and

(ii) Functions of civil Engineering.

(i) Scope of civil Engineering According to the field of work, Area of services and Type of structure:

⇒ They are

a) Building Construction.
b) Construction of Heavy Structures.
c) Geotechnical Engineering.
d) Transportation Engineering.
e) Water Resource Engineering.
f) Environmental Engineering.
g) Town Planning

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a) Building Construction:

- Constructing residential buildings like apartments, tenaments, flats, row houses, bunglows, villas, etc.
- Constructing Public buildings like schools, colleges, post offices, hospitals, etc.
- Constructing industrial buildings like workshops, ware houses, stores, and industrial sheds.
- It also includes study of building materials and constructing methods and techniques of building components like foundation, masonry, doors and windows, etc.

b) Construction of Heavy Structures :-

- Constructing bridges, dams, ports, airports, underwater constructions, tunnels, etc. with advanced construction techniques.
- It also includes study of several advanced techniques, modern equipments and materials.

c) Geotechnical Engineering :-

- Constructing several types of foundations like simple footing, well foundation, pile foundation, coffer dams & foundations of machines subjected to vibrations is the main scope of geotechnical engineering.
- It further includes constructing tunnel, earthern dams, earth work for highways & railways, soil investigation & soil testing.

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d) Transportation Engineering :-

- Constructing structures related to transportation engineering like roads, highways, railways, bridges, tunnels, ports, harbour, runways and airports.
- It also includes traffic engineering & study of highway materials.

e) Water Resources Engineering :-

- Constructing structures related to water resources engineering like dams, barrages, canals, canal structures & hydropower station.
- It also includes irrigation methods, water shed management, rainwater harvesting, soil conservation, open channel hydraulics, hydrology, Flood control & water power engineering.

f) Environmental Engineering :-

- Constructing structures relating to public health engineering like units of water treatment plant, water distribution network, under ground sump, over head tank, units of waste water treatment plant, sewerage and drainage system and pumping stations.
- It also includes pollution control and solid waste collection from the town and its disposal.

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g) Town Planning :-

- Planning of town by zoning of the land, planning road network, planning other services like water supply and drainage.
- Preparing master plan of town planning schemes and regulating construction by building byelaws.

(ii) Scope of civil Engineering According to the functions of civil Engineering :-

⇒ They are

a) Surveying
b) Planning
c) Structural analysis and design
d) Proffesional practice.
   (i) Estimating (ii) Costing and accounts (iii) Valuation
   (iv) Contracts
e) Construction Management
   (i) Planning (ii) Construction execution and supervision
f) Quality control & research
g) Maintenance of structure.

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a) Surveying :-

- To carry out surveying for setting out of works and for preparing map of land.
- Levelling is carried out to measure levels & to prepare contour maps.
- Measurement of distances & angles are taken with the help of surveying instruments.
- Maps are useful for planning of construction project.

b) Planning :-

- To carry out planning of different units according to their functional needs.
- Technical feasibility study, economic viability study, environment impact analysis, surveying and soil investigations are different planning activities.
- On the bases of data collected & map prepared by surveying, planning of project is made.

c) Structural Analysis and Design :-

- To carry out structural design of structure by selecting the type of material like concrete or steel and fixing the size & shape of various structural components like slab, beam, etc.
- Structural analysis is required prior to designing of structure.

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d) Professional Practices:

(i) Estimation :- To prepare estimate of work. Estimates are prepared from data of drawings, specifications, rates, etc. The procedure for preparing estimate is known as estimating.

(ii) Costing and Accounts :- To carry out costing to know the actual expenditure in payment of bills to contractor & many other expenditure, during construction of work.

(iii) Valuation :- To carry out valuation of property like land or land with building. Valuation is carried out for the purpose of knowing the fair and just price or market value of property for purposes of sales, purchases, insurance, taking loans & other purposes.

(iv) Contracts :- To carry out construction of work through contractor according to conditions of contracts. On bases of contractor's Qualification, past performance & rates filled in tender papers, work is allocated to contractor.

e) Construction Management :-

(i) Planning and Scheduling :- To carry out project planning & prepare different schedules. Scheduling is procedure of fixing the order of execution of different activities during construction. For preparing schedules methods like bar chart & critical path methods are generally used. Economic analysis is also carried out to know the economic viability and to select one alternative among several other options.

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f) Quality Control and Research:-

- To have a quality check by testing of material & checking workmanship.
- During actual construction, quality of material can be checked by testing various properties of materials.
- Materials should comply the needs of specifications.
- Workmanship like dimensions, lines, levels, finishing, etc. is also required.
- To carry out research for improvement in quality, strength, durability and look of structure through innovative structures.

g) Maintenance of Structure :-

- To carry out maintenance of structure after construction is over.
- Structure needs maintenance & proper care.
- Due to continuous utilization of structure, wear & tear occur hence maintenance of structure is.
- Repair works are required to protect the structures to make them free from effects of damage or deteriotation.
- Some maintenance works are carried out annually like painting & white washing.

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2) Write a note on role of civil engineer.

Civil Engineer is the one who designs or maintains work for public utilities.

- Following are main roles or duties of civil engineers.

1) The main role of civil engineer is in surveying, planning, designing, estimation & execution of structures like buildings, roads, bridges, railways, ports, airports, dams, etc.

2) To use specific & engineering principles for artistic, optimum, economical & technical solutions of different engineering problems.

3) To solve different engineering problems with the help of field experience, laboratory techniques, numerical methods, mathematic models, using computer & information technology.

4) To implement management techniques for better management of man, material, machine & money. To carry out planning of execution of work by various scheduling techniques like bar chart & critical path method (CPM).

5) To carry out surveying & levelling with survey instruments for setting out of works & preparing map or contour map, etc. of site. To fix boundaries of plots & to calculate area & volume. To fix the alignments of roads, canals, railways, pipes, tunnels, etc.

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6) To carry out soil investigations for design of foundations of structures.

7) To carry out planning of building as per its functional needs, as suggested by client or user, the building may be residential building, public building or industrial building, etc. He has to plan buildings according to byelaws of local authorities & get construction approval from them like municipalities. Civil engineer has also a role in town & regional planning.

8) To carry out design of structures as per the principles of structural analysis and design. He should also ensure that design is safe, durable & economic.

9) To carry out quantity survey & to prepare estimate to know probable cost of completion of work.

10) To invite tenders & to select contractor for work.

11) To supervise the work during execution & to ensure progress of work.

12) To carry out valuation of land or building for purpose of finding its sale or purchase price.

13) Civil engineers are mainly concerned with structures of public utility like transportation, irrigation & public health engineering.

14) Major civil engineering projects are known by government for public welfare. Civil engineer has to work for general welfare of people.

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Q) Discuss the impact of infrastructural development on economy of a country.

Ans * Construction sector in India :-

- Indian construction industry employes more than 3.3 crore people.
- Contribution of construction industry is about 6.5% of GDP.
- More than half of expenditure budget is spent on construction.
- There are more than 200 firms in corporate sector & more than 1,20,000 class-A contractors in India. Around 75% of nations working population is depending for its employment on construction.

* Infrastructure :-

- The infrastructural sectors covers a wide range of services such as (i) transportation which includes roads, railways, ports, airports, etc., (ii) water resources projects (iii) power generation, transmission & distribution, (iv) telecommunication, (v) postal facilities, (vi) banking and (vii) Science and technology.

* Infrastructure Details of India and Gujarat :-

(a) India :-

- India has geographical area of 82,87,590 sq. km & population of 102,87,37,436 (in 2001) & coast line of 6100 km of mainland.

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- Roadways carry 70% of freight traffic & 85% of passenger traffic.
- Traffic on road is growing at 7 to 10% per year while vehicle population is growing 12% per year.
- Railways carry 15% of passenger traffic & 30% freight traffic.
- In country there are 12 major & 187 minor ports.
- Approximately 95% of contry's trade volume (70% in terms of value) is transported by sea.
- India has total 449 air strips. Airport Authority manages 125 airports. There are 11 international airports.
- There are 77 civil domestic airports.
- India has 37675 telephone exchanges & 99.17 million telephone connections & 42.12 million cellular subscribers in 2005.
- India has created irrigation potential in 93.95 million hectares upto 2002.

(b) Gujarat :-

- Gujarat has geographical area of 1,96,024 sq. km. & population of 5,06,71,017 (2001) & coastline of 1600 km.
- It has 2362 km of highway & 5310 km of railway length.
- It has India's first express way no. 1. Ahmedabad - Baroda expressway is 95 km.
- It has 1 major port at Kandla & 40 minor ports.
- It has 11 airports of which 1 international airport at Ahmedabad & other domestic airports.
- Gujarat has 3.429 million hectares of land under irrigation.

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* Impact of infrastructure Development on Economic Development of Country :-

- Infrastructure is backbone of nation's progress.
- It is a main engine of economic progress.
- For economic and industrial development of a nation, infrastructural development is a basic and prime need.
- During 11th five year plan (2007-12) estimated investment requirement on infrastructure is near to Rs. 14,50,000 cror
- Well Developed infrastructural facilities are key to development of any nation.
- Most of infrastructural projects are relating to construction of transport systems and heavy constructions.
- The infrastructural facilities mainly transport, power, communication water resources, banking, science and technology.
- Due to basic facilities which any industry needs are provided by infrastructure, hence industrial growth is accelerated.
- In India, due to recent development in infrastructural sector country has progressed well.
- Per Capita income & Gross Domestic Product are economic measures for assessment of development.

a) Per Capita Income :-

- Per Capita income is average income a normal resident of a country in a particular year.
- It is obtained by dividing national income of a country by its population.

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Gross Domestic Product (GDP):-

- Gross Domestic Product at market prices is the value of all fixed goods & services at prices prevailing in the market produced in domestic territory of a country during a given year.

Year	2006-07	2007-08	2008-09
Per Capita income Rs.	22,580	24295 (7.6%)	25,494 (4.9%)
GDP Rs. Crore (At Factor Cost)	28,71120	31,29,717 (9.0%)	33,39,375 (6.7%)

- Due to acceleration of progress of infrastructural projects overall development & upliftment of common people can be done.
- Thus, the infrastructure development is key to economic development of any country.
- Under the umbrella of well developed infrastructural network industrial growth will be flourished & nourished.

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