DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Mid Semester Examination – October - 2017

Branch: **Sem.:- I**

Subject with Subject Code: - Basic Civil Engineering (CV105) **Marks: 20**

Date: - **Time:- 1 Hr.**

Instructions:-

(Marks)

Q.1 Select appropriate answer for the given multiple choice questions. (6 x 1)

i) Black cotton soil is not suitable for foundation because of it's……… (d) none of these

ii) Verticality of walls is checked by using………(c) plumb bob

iii) The vertical faces of a door opening which support frame of the door, are….(a) jambs

iv) The commonly used material in the manufacture of cement is….. (c) lime stone

v) Seasoning of timber is done…….. (d) remove water

vi) Bulking of sand is caused due to……….(a) surface moisture

Q.2 Attempt any one of the following: (1 x 6)

(a) Explain in brief the semi-dry process of cement manufacturing.

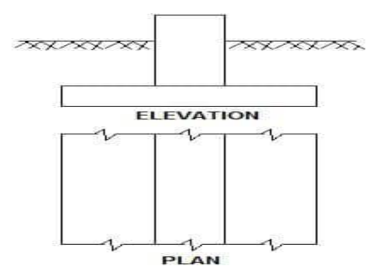
The raw materials required for manufacture of Portland cement are calcareous materials, such as limestone or chalk, and argillaceous material such as shale or clay. The process of manufacture of cement consists of grinding the raw materials, mixing them intimately in certain proportions depending upon their purity and composition.

Semi dry method: In the semi-dry process the raw materials are crushed dry and fed in correct proportions into a grinding mill where they reduced to a very fine powder. The dry powder called the raw meal is then further blended and corrected for its right composition and mixed by means of compressed air. The aerated powder tends to behave almost like liquid and in about one hour of aeration a uniform mixture is obtained. The blended meal is further sieved and fed into a rotating disc called granulator. A quantity of water about 10-14 per cent by weight is added to make the blended meal into pellets. This process of manufacturing cement requires less fuel compared to wet process, as only 10-14 percent of water is mixed, whereas in the wet process the slurry contains about 35 to 50 per cent water. Water is added to permit air flow for exchange of heat for further chemical reactions and conversion of the same into clinker further in the rotary kiln. The rotary kiln is an important component of a cement factory. It is a thick steel cylinder of diameter anything from 3 metres to 8 metres, lined with refractory materials, mounted on roller bearings and capable of rotating about its own axis at a specified speed. The length of the rotary kiln may vary anything from 30 metres to 200 metres. The kiln is fired from the lower end. The fuel is either powder coal, oil or natural gas. By the time the material rolls down to the lower end of the rotary kiln, the dry material undergoes a series of chemical reactions until finally, in the hottest part of the kiln, where the temperature is in the order of 1500°C, about 20 to 30 per cent of the materials get fused. The fused mass clinker is in nodular form of size 3 mm to 20 mm. The equipments used in the semi-dry process kiln is comparatively smaller than that in wet process, hence it is comparatively economical. The total consumption of coal is also less compared to wet process. Clinker is then cooled from about 1500°C to about 500°C in about 15 minutes and from the 500°C the temperature is brought down to normal atmospheric temperature in about 10 minutes. The rate of cooling influences the degree of crystallisation, the size of the crystal and the amount of amorphous materials present in the clinker. The properties of this amorphous material for similar chemical composition will be different from the one which is crystallined. The cooled clinker is then ground in a ball mill with the addition of 3 to 5 per cent of gypsum in order to prevent flash-setting of the cement. A ball mill consists of several compartments charged with progressively smaller hardened steel balls. The particles crushed to the required fineness are separated by currents of air. In the modern process of grinding, the particle size distribution of cement particles are maintained in such a way as to give desirable grading pattern. Just as the good grading of aggregates is essential for making good concrete, it is now recognised that good grading pattern of the cement particles is also important. After grinding the product is taken to storage silos from where it is sent for packaging.

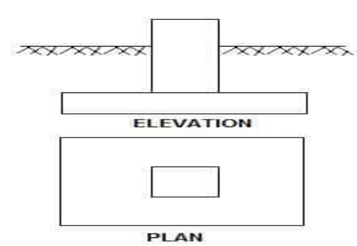
(b) Explain different types of shallow foundations and their uses. (with neat sketches).

The different types of shallow foundation are: Strip footing, Spread or isolated footing, Combined footing, Strap or cantilever footing, Mat or raft Foundation.

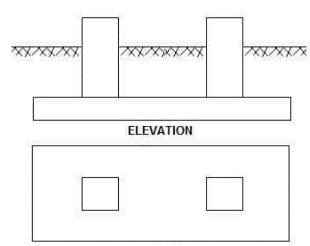
1. Strip Footing: A strip footing or continuous footing is provided for a load-bearing wall. A strip footing is also provided for a row of columns which are so closely spaced that their spread footings overlap or nearly touch each other.



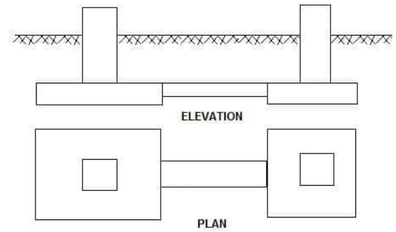
2. Spread or Isolated Footing: A spread footing or isolated or pad footing is provided to support an individual column. Sometimes, it is stepped or haunched to spread the load over a large area. A spread footing is circular, square or rectangular slab of uniform thickness.



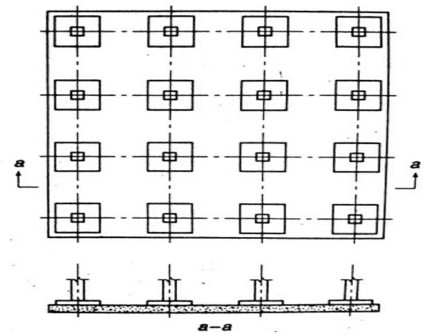
3. Combined Footing: A combined footing supports two columns. It may be rectangular or trapezoidal in plan. It is used when the two columns are so close to each other that their individual footings would overlap. Also it is provided when the property line is so close to one column that a spread footing would be eccentrically loaded when kept entirely within the property line.



4. Strap or Cantilever footing: A strap or cantilever footing consists of two isolated footings connected with a structural strap. The strap connects the two footings such that they behave as one unit.



5. Mat or Raft Foundations: A mat or raft foundation is a large slab supporting a number of columns and walls under the entire structure or a large part of the structure. A mat is required when the allowable soil pressure is low or where the columns and walls are so close that individual footings would overlap or nearly touch each other. Mat foundations are useful in reducing the differential settlements on non-homogeneous soils or where there is a large variation in the loads on individual columns.



Q.3 Attempt any two of the following: (2 x 4)

(a) What are the important properties of aggregates for making concrete?

Aggregates are used in concrete to provide economy in the cost of concrete. The properties of aggregate which influence the properties of resulting concrete mix are as follow: Composition, Size & Shape, Surface Texture, Strength, Specific gravity and bulk density, Moisture content, Bulking factor, Cleanliness, Soundness, Chemical properties, Thermal properties, Durability, etc.

1. Composition: Aggregates consisting of materials that can react with alkalies in cement and cause excessive expansion, cracking and deterioration of concrete mix should never be used. Therefore it is required to test aggregates to know whether there is presence of any such constituents in aggregate or not.

2. Size & shape: The size and shape of the aggregate particles greatly influence the quantity of cement required in concrete mix and hence ultimately economy of concrete. For the preparation of economical concrete mix one should use largest coarse aggregates feasible for the structure.

3. Surface texture: The development of bond strength between aggregate particles and cement paste depends upon the surface texture, surface roughness and surface porosity of the aggregate particles. If the surface is rough but porous, maximum bond strength develops. In porous surface aggregates, the bond strength increases due to setting of cement paste in the pores.

4. Specific gravity: Specific gravity is a mean to decide the suitability of the aggregate. Low specific gravity generally indicates porous, weak and absorptive materials, whereas high specific gravity indicates materials of good quality.

5. Bulk density: Bulk density of aggregates depends upon the following three factors: Degree of compaction, Grading of aggregates, Shape of aggregate particles.

6. Voids: The empty spaces between the aggregate particles are known as voids. The volume of void equals the difference between the gross volume of the aggregate mass and the volume occupied by the particles alone. Aggregates should have minimum voids.

7. Porosity & absorption: The minute holes formed in rocks during solidification of the molten magma, due to air bubbles, are known as pores. Aggregates should be non porous and non-absorptive.

8. Bulking of sand: It is in increase in the bulk volume of the quantity of sand in a moist condition over the volume of the same quantity of dry or completely saturated sand. When water is added to dry and loose sand, a thin film of water is formed around the sand particles. Interlocking of air in between the sand particles and the film of water tends to push the particles apart due to surface tension and thus increase the volume.

9. Fineness modulus: Fineness modulus is generally used to get an idea of how coarse or fine the aggregate is. More fineness modulus value indicates that the aggregate is coarser and small value of fineness modulus indicates that the aggregate is finer.

10. Specific surface of aggregate: The surface area per unit weight of the material is termed as specific surface. This is an indirect measure of the aggregate grading. Specific surface increases with the reduction in the size of aggregate particle.

11. Deleterious materials: Aggregates should not contain any harmful material in such a quantity so as to affect the strength and durability of the concrete. Such harmful materials are called deleterious materials, e.g. clay, silt & dust, salt contamination, etc.

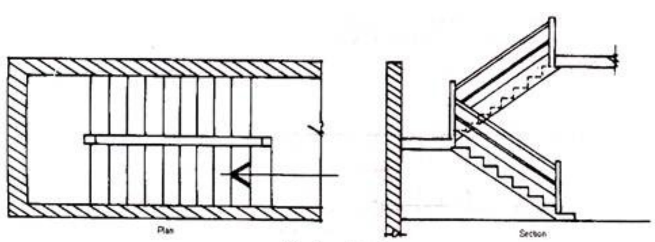
12. Crushing value: The aggregates crushing value gives a relative measure of resistance of an aggregate to crushing under gradually applied compressive load. The aggregate crushing strength should be high value.

13. Impact value: The aggregate impact value gives a relative measure of the resistance of an aggregate to sudden shock or impact. The aggregate impact strength should be high.

14. Abrasion value of aggregates: The abrasion value gives a relative measure of resistance of an aggregate to wear.

(b) What is the function of staircase in building? Draw neat sketch of dog-legged staircase.

The primary function of stairs is to provide access to another floor, safe and easy means to travel, a degree of insulation, escape route in case of fire, etc.



a. Dog legged stair
Fig. 6.5 Half turn stair

(c) Write a short note on desirable properties of stones used for construction of buildings.

No single stone can satisfy all the below mentioned quality requirements. For example, strength and durability requirement contradicts ease of dressing requirement. Hence one has to look into the properties required for the intended work and selects the stone accordingly.

The following are the requirements of good building stones:

1. Strength: Generally most of the building stones have to resist the loads coming on it. The stones used should have high compressive strength. Compressive strength of building stones generally fall within the range of 60 to 200N/mm^2.

2. Durability: Building stones should be capable to resist the adverse effects of natural forces like wind, rain and heat. It must be durable and should not deteriorate due to the adverse effects of the above natural forces.

3. Hardness: When stones are used in floors, pavements or aprons of bridges, they become subjected to wearing and abrasive forces caused by movement of men or machine over them. Hence the stones used should have resistance to wearing and abrasion.

4. Toughness: Toughness of stones means it ability to resist impact forces. Building stones should be tough enough to sustain stresses developed due to vibrations. The vibrations may be due to the machinery mounted over them or due to the loads moving over them. The stone aggregates used in the road constructions should be tough.

5. Specific gravity: The more the specific gravity of stone, the more heavier and stronger the stone is. Therefore stones having higher specific gravity values should be used for the construction of dams, retaining walls, docks and harbours.

6. Porosity and absorption: Porosity of building stones depend upon the mineral constituent and structural formation of the parent rock. If stones used in building construction are porous then rain water can easily enter into the pore spaces and cause damage to the stones. Therefore building stone should not be porous and non absorptive.

7. Dressing: Giving required shape to the stone is called dressing. It should be easy to dress so that the cost of dressing is reduced.

8. Appearance: In case of the stones to be used for face works, where appearance is a primary requirement, its colour and ability to receive polish is an important factor. Light coloured stones are more preferred than dark coloured stones as the colour are likely to fade out with time.

9. Seasoning: Good stones should be free from the quarry sap. Lateritic stones should not be used for 6 to 12 months after quarrying. They are allowed to get rid of quarry sap by the action of nature. This process of removing quarry sap is called seasoning.

10. Workability: Stone should be workable. Stone is said to be workable when the work involved in stone working (such as cutting, dressing & shaping) is economical and easy to conduct.

11. Cost: Cost is an important consideration in selecting a building material. Proximity of the quarry to building site brings down the cost of transportation and hence the cost of stones comes down.

12. Fire resistance: Stones should be free from calcium carbonate, oxides of iron, and minerals having different coefficients of thermal expansion. Igneous rock show marked disintegration principally because of quartz which disintegrates into small particles at a temperature of about 575°C. Limestone, however, can withstand a little higher temperature; i.e. up to 800°C after which they disintegrate.

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