

2 MARK QUESTIONS WITH ANSWERS
CE6502 - FOUNDATION ENGINEERING

Subject Code: CE6502

Unit 1

1. What are the informations obtained in general exploration?

Preliminary selection of foundation type, depth of water, depth and composition of soil strata, Engineering properties required disturbed or partly disturbed samples, approximate values of strength and compressibility.

2. Define significant depth?

Exploration depth, in general it should be carried out to a depth up to which increase in the pressure due to structural loading is likely to cause shear failure, such depth is known as significant depth.

3. What are the types of soil samples?

- disturbed soil sample
- undisturbed soil sample

4. What is the difference between disturbed and undisturbed soil sample?

Disturbed soil sample

——— Natural structure of soils get partly or fully modified and destroyed

Undisturbed soil sample

——— Natural structure and properties remain preserved

5. What are the disadvantages of wash boring?

- It is a slow process in stiff soil.
- It cannot be used effectively in hard soil, rocks etc.

6. What are design features that affect the sample disturbance?

Area ratio, inside clearance ratio, outside clearance ratio, inside wall friction, method of applying force.

7. What are the corrections to be applied to the standard penetration number?

- overburden pressure correction
- dilatancy correction

8. What are various methods of site exploration?

Open excavation, borings, geophysical methods, sub-surface soundings.

9. What are the methods of boring?

Auger borings, shell boring, wash boring, rotary boring, percussion boring.

10. Define area ratio?

Area ratio is defined as the ratio of maximum cross sectional area of the cutting edge to the area of the soil sample.

11. Define liquefaction of sand?

The mass failure occurs suddenly, and the whole mass appears flow laterally as if it were a liquid such failure is referred to as liquefaction.

12. How will you reduce the area ratio of a sampler?

By increasing the size of the soil sample.

13. What are representative and non-representative samples?

Representative sample – Natural moisture content and the proportion of mineral constituents are preserved even though the structure is disturbed.

Non-Representative sample – In addition to alteration in the original soil structure, soils from other layers get mixed up or mineral constituents get altered.

14. What are the objectives of site investigation?

- To select the type and depth of foundation for a given structure.
- To determine the bearing capacity of soil.
- To estimate the probable maximum and differential settlements.
- To select suitable construction techniques.

15. Name the soil properties that can be found from disturbed samples.

Disturbed samples can be used to determine the index properties of soil such as grain size, plasticity characteristics, and specific gravity.

16. Name the indirect method of soil exploration.

- Sounding or penetration tests
- Geophysical methods

17. List the various soil samplers.

- Open drive sampler
- Stationary piston sampler
- Rotary sampler

18. Define recovery ratio.

The ratio of length of sampler to the depth of penetration is known as Recovery ratio.

19. List any two objectives of foundation.

- It transfers the load from super-structure and its own weight to the soil.
- It gives stability to the super structure.

20. When thin walled sampler is used for sampling?

It is used for those soils which are very sensitive to disturbances such as soft clays and plastic silts.

UNIT 2

1. What are components of total foundation settlement?

Elastic settlement, consolidation settlement, secondary consolidation settlement.

2. What are the types of shear failure?

General shear failure, local shear failure, punching shear failure

3. What are assumptions in Terzaghi's bearing capacity theory?

- the base of the footing is rough
- the load on footing is vertical and uniformly distributed
- the footing is continuous

4. List out the methods of computing elastic settlements?

Based on the theory of elasticity, Pressure meter method, Janhu –Bjerram method, Schmmentmann's method.

5. Define ultimate bearing capacity?

Gross pressure at the base of the foundation at which the soil fails in shear is called ultimate bearing capacity.

6. Define net ultimate bearing capacity?

Net pressure increase in pressure at the base of the foundation that causes failure in shear, is called as net ultimate bearing capacity.

7. Define allowable bearing capacity?

It is the net loading intensity at which neither the soil fails in shear nor there is excessive settlement detrimental to the structure.

8. What are the requirements for a stable foundation?

- -must be safe from failure
- -must be properly located
- -must not settle or deflect sufficiently to damage the structure or impair its usefulness.

9. What are the factors which depends depth?

Type of soil, size of structure, magnitude of loads, environmental conditions etc.

10. Define net pressure intensity?

It is the excess pressure, of the gross pressure after the construction of the structure and the original overburden pressure.

11. What are the zones used in the Terzaghi's bearing capacity analysis for dividing the failure envelope of the soil?

Elastic equilibrium zone, Radial Stress zone, plastic zone.

12. Define Shallow foundation.

If the depth of the foundation is less than its breadth, such foundation is known as shallow foundation.

13. When will the total settlement be completed in the case of cohesion-less soil?

Once the construction is over, the total settlement is assumed to be completed.

14. Define differential settlement

If any two points of the foundation base experiences different settlements then such settlement is known as differential settlement.

15. What type of shear failure of soil is more likely to happen in the case of very dense soil?

Usually punching shear failure and local shear failure may also be possible.

16. When will the Consolidation settlement get completed?

In the case of cohesion-less soil, the consolidation settlement gets completed once the construction is over. But In the case of cohesive soil, the consolidation settlement takes place for several years.

17. Define Deep foundation

If the depth of the foundation is equal to or greater than the breadth of the foundation such foundation is called as deep foundation.

18. For which type of foundation, Terzaghi's bearing capacity equation is applicable. Why?
Shallow foundation only. Because the effect of the depth is not considered.

UNIT 3

1. Under what circumstances, a strap footing is adopted?

When the distance between the two columns is so great, so that trapezoidal footing is very narrow and so it is uneconomical. It transfers the heavy load of one column to other column.

2. What is a mat foundation?

It is a combined footing that covers the entire area beneath a structure and supports all the walls and columns.

3. Where mat foundation is used?

It is used when the area of isolated footing is more than fifty percentage of whole area or the soil bearing capacity is very poor.

4. Define spread footing?

It is a type of shallow foundation used to transmit the load of isolated column, or that of wall to sub soil. The base of footing is enlarged and spread to provide individual support for load.

5. What are types of foundation?

Shallow foundation, deep foundation.

6. What are the footings comes under shallow foundation?

Spread footing or pad footings, strap footings, combined footings, raft or mat foundation.

7. What are the footings comes under deep foundation?

Pile, caissons (well foundation).

8. Define floating foundation?

It is defined as a foundation in which the weight of the building is approximately equal to the full weight of the soil including water excavated from the site of the building.

9. What is mean by proportioning of footing?

Footings are proportional such that the applied load including the self weight of the footing including soil, the action are not exceeding the safe bearing capacity of the soil.

10. What are the assumptions made in combined footing?

- The footing is rigid and rests on a homogenous soil to give rise to linear stress distribution on the bottom of the footing.

- The resultant of the soil pressure coincides with the resultant of the loads, then it is assumed to be uniformly distributed.

11. State the assumptions made in the conventional structural design of footings.

- The footing is rigid.
- The contact pressure distribution is linear.

12. Name the different types of rafts.

Flat plate type, flat plate thickened under columns, box structures and mats placed on piles.

13. What are the two methods of design of raft foundation as per IS?

- Conventional method
- Elastic method or soil line method

14. How do you identify the expansive soil?

Expansive soils are generally residual soils left at place of their formation after chemical decomposition of the rocks such as basalt and trap. These soil expand when the moisture content of the soils is increased.

15. Under what situation combined footing is preferred?

It is preferred when the columns are close to each other and if the soil is of expansive in nature.

16. Write any two advantages of the floating foundation.

- The structure is not subjected to any increase in stress.
- The settlement will be less.

17. Enumerate the advantages of mat foundation?

- Net pressure on the soil is considerably reduced.
- Differential settlement gets reduced.
- It is more economical than individual footing.

18. What do you understand by truly elastic elastic foundation?

The soil is assumed to be continuous elastic medium obeying Hooke's law.

UNIT 4

1. List out the type of pile based on material used?

Timber pile, concrete pile, steel pile, composite pile.

2. How is the selection of pile carried out?

The selection of the type, length and capacity is usually made from estimation based on the soil condition and magnitude of the load.

3. What is mean by group settlement ratio?

The settlement of pile group is found to be many times that of a single pile. The ratio of the settlement of the pile group to that of a single pile is known as the group settlement ratio.

4. What are the factors consider while selecting the type of pile?

- -the loads
- -time available for completion of the job
- -availability of equipment
- -the ground water conditions
- -the characteristics of the soil strata involved

5. What are the types of hammer?

Drop hammer, diesel hammer, double acting hammer, single acting hammer, vibratory hammer

6. What is pile driver?

Piles are commonly driven by means of a hammer supported by a crane or by a special device known as a pile driver.

7. What are methods to determine the load carrying capacity of a pile?

- dynamic formulae
- static formula
- pile load test
- penetration tests

8. What are the two types of dynamic formulae?

- Engineering news formula
- Hiley's formula

9. What is meant by single-under reamed pile?

The pile has only one bulb is known as single under reamed pile.

11. Define modulus of subgrade reaction?

The ratio of soil reaction (p) to the deflection (y) at any point is defined as the modulus of subgrade reaction(E_s) or soil modulus.

12. What are under reamed piles?

Under reamed piles are bored cast in situ concrete piles having one or more bulbs formed by enlarging the bore hole for the pile stem by an under reaming tool.

13. What is negative skin friction?

When the soil layer surrounding a portion of pile shaft settles more than the pile, a downward drag occurs on the pile. The drag is known as “Negative skin friction”.

14. What is the use of batter pile?

The batter piles are used to resist large horizontal forces or inclined forces.

15. What is the need for pressure piles?

These piles are especially suitable for those congested sites where heavy vibrations and noise are not permitted and also where heavy pile driving machinery cannot move in.

16. State any two functions of pile foundation.

- It transfers the load from soft strata to hard soil strata.
- It will resist uplift and inclined forces, hydrostatic pressure.

17. Define pile cap.

Pile cap is a thick concrete mat that rests on concrete or timber piles that have been driven in to soft or unstable ground to provide a suitable stable foundation.

18. When a pile foundation is preferable?

- When the strata at or just below the ground surface is highly compressible and very weak to support the load transmitted by the structure.
- To transmit the loads of the structure through deep water to a firm stratum.

UNIT 5

1. Define conjugate stresses?

The stress acting on the conjugate planes is called conjugate stresses.

2. How do you check the stability of retaining walls?

- the wall should be stable against sliding
- the wall should be stable against overturning
- the base of the wall should be stable against bearing capacity failure

3. Define angle of repose?

Maximum natural slope at which the soil particles may rest due to their internal friction, if left unsupported for sufficient length of time.

4. Define theory of plasticity?

The theory on which the condition of the stress in a state of a plastic equilibrium is called as theory of plasticity.

5. What are assumptions in coulomb wedge theory?

- The backfill is dry, cohesionless, isotropic, and homogenous.
- The slip surface is plane which passes through the head of the wall.

6. How to prevent land sliding?

Sheet piles, retaining wall may be used to prevent the land sliding.

7. Write down any two assumptions of Rankine's theory?

- semi infinite soil
- cohesion-less backfill
- homogenous soil
- The top surface is a plane which may be inclined or horizontal.

8. Distinguish Coloumb's wedge theory from Rankine's theory?

Rankine considered a soil particle at plastic equilibrium but Coulomb considered the whole soil mass.

9. What is coefficient of lateral earth pressure?

The ratio of horizontal stress to the vertical stress is called co-efficient of lateral earth pressure.

10. Retaining walls are usually designed for active earth pressure. Why?

A retaining structure is required to provide lateral support to the soil mass behind it. The tendency of the backfill is to push the retaining wall away from it such that the soil stretches horizontally. This state is active and hence the retaining walls are designed for active earth pressure.

11. Why the passive earth pressure is not normally considered in the design?

The passive earth pressure occurs when a wall or plane moves towards earth. This will create additional pressure where as in the case of active pressure, wall moves away from earth and therefore there is a reduction in pressure on the wall. That is why passive earth pressure is not used in the design.

12. What is surcharge?

The position of backfill lying above a horizontal plane at the elevation of the top of a wall is called the "surcharge".

13. What is earth pressure at rest?

The earth pressure at rest, exerted on the back of a rigid, unyielding retaining structure, can be calculated using theory of elasticity, assuming the soil to be semi-infinite homogeneous, elastic and isotropic.

14. Define surcharge angle.

The position of the back fill lying above a horizontal at the elevation of top of a wall is called surcharge and its inclination to the horizontal is called “surcharge angle”.

15. Define co-efficient of earth pressure at rest.

When the soil is elastic, the ratio of the horizontal stress to the vertical stress is called co-efficient of earth pressure at rest.

16. Define passive earth pressure.

The passive earth pressure occurs when a wall or plane moves towards the earth.

17. Define active earth pressure.

The active earth pressure occurs when the wall moves away from the earth and reduces pressure.

18. What is meant by plastic equilibrium?

A body of soil is said to be in plastic equilibrium if every point of it is on the verge of failure.

19. Name the theories which are referred to as “classical earth pressure theories”.

Rankine’s theory and coulomb theory.

20. List out the aspects using which stability of retaining wall has been ensured.

- Over turning
- Sliding
- Bearing capacity failure