Roll no._____ **ID: 180745**

Semester: 4th

Branch: Civil Engg.

Subject Name: Soil Mechanics and Foundation Engineering

Time Allowed : 3 Hrs. **MM:100**

Section –A

Note: Multiple Choice questions. All questions are compulsory. **10x1=10**

Q.1 The term soil compaction refers to:
a) The process of adding water to the soil
b) The process of increasing the density of the soil
c) The process of reducing the density of the soil
d) The process of adding air to the soil

Q.2 The unit weight of soil is defined as:
a) The weight of the soil per unit volume
b) The weight of the soil per unit area
c) The weight of the soil per unit length
d) The weight of the soil per unit thickness

Q.3 The term "effective stress" refers to:
a) The total stress acting on the soil
b) The stress caused by the weight of the soil
c) The stress caused by the water in the soil
d) The stress caused by the soil particles on each other

Q.4 The bearing capacity of a soil is defined as:
a) The ability of the soil to support loads without excessive settlement
b) The ability of the soil to resist shear forces
c) The ability of the soil to transmit water
d) The ability of the soil to withstand tensile forces

Q.5 The term "consolidation" refers to:
a) The process of adding water to the soil
b) The process of reducing the density of the soil
c) The process of increasing the density of the soil
d) The process of settling of the soil over time

Q.6 The standard penetration test (SPT) is used to determine:
a) The shear strength of the soil
b) The compressibility of the soil
c) The permeability of the soil
d) The density of the soil

Q.7 TheTriaxial compression test is used to determine:
a) The shear strength of the soil
b) The compressibility of the soil
c) The permeability of the soil
d) The density of the soil

Q.8 The undrained shear strength of a soil is typically measured:
a) In a direct shear test
b) In a triaxial compression test
c) In a consolidation test
d) In a permeability test

Q.9 The OMC (Optimum Moisture Content) of a soil is:
a) The moisture content at which the soil has the maximum shear strength
b) The moisture content at which the soil has the minimum shear strength
c) The moisture content at which the soil has the maximum density
d) The moisture content at which the soil has the minimum density

Q10 What is the bearing capacity of a soil?
a) The maximum load that can be applied to a soil without causing it to fail.

b) The maximum shear stress that a soil can withstand.
c) The maximum tensile stress that a soil can withstand.
d) The maximum compressive stress that a soil can withstand.

Section-B

Note: Objective type questions. All questions are compulsory. 10x1=10

Q.11 The term used to describe the force per unit area acting on a plane within a soil mass is _____.
Q.12 In the soil classification system, the abbreviation "CL" stands for _____.
Q.13 A soil's capacity to bear a load without excessive settlement is known as its _____.
Q.14 The process by which soil particles settle and the void space decreases is called _____.
Q.15 The weight of water contained in a soil is known as its _____.
Q.16 The shear strength of a soil is directly proportional to its effective stress. (True/ False)
Q.17 A cohesive soil has a high permeability. (True/ False)
Q.18 A soil's shear strength is independent of its particle size distribution. (True/ False)
Q.19 Define Phase Diagram of Soil.
Q.20 Define Footing .

Section –C

Note: Short answer type Questions. Attempt any twelve questions out of fifteen questions. 12x5=60

Q.21 Explain different type of earth pressure.
Q.22 Define the relative density, What is its practical utility?
Q.23 Explain the different types of soil and their characteristics.
Q.24 What is Plastic Limit of Soil and how it is measured?
Q.25 Soil is three phase system, define the conditions when it is converted to two phase system.
Q.26 What do you mean by permeability and what are the methods to measure the permeability of Soil?
Q.27 What is the difference between Compaction and Consolidation?
Q.28 What is Standard Penetration test and How it is done?
Q.29 What do you mean Shear Strength of Soiland what are different methods to measure the Shear Strength of Soil?
Q.30 Define Coulombs law showing diagrammatic representation for all types of Soil.
Q.31 Explain OMC, MDD, Zero air void line with the help of compaction curve.
Q.32 What is Plate Load Test? What are the limitations of it?
Q.33 What is Recovery Ratio? Give its Significance.
Q.34 Give the classifications of pile according to materials and composition.
Q.35 What is well foundation? Give its necessity

Section-D

Note: Long answer type questions. Attempt any two questions out of three questions. 2x10=20

Q.36 a) What are the different methods of soil exploration? Describe the advantages and disadvantages of each method.
b) Define area ratio, inside clearance and outside clearance.
Q.37 Describe any 5 different laboratory tests used in soil mechanics and their significance.
Q.38 a) Explain the significance of soil settlement in foundation engineering. Describe the different types of soil settlement and their causes.
b) Describe the different types of shallow foundations and their advantages and disadvantages.

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Roll No.....

4th Sem,

Branch : Civil Engineering

Subject : Soil Mechanics & Foundation Engineering

Time : 3 Hrs. **M.M. : 100**

SECTION-A

Note : Multiple choice questions. All questions are compulsory. (10x1=10)

Q.1 Black cotton soil chiefly contains clay mineral.(CO-1)

a) Illite b) Montmorillonite

c) Kaolinite d) None of these

Q.2 The fundamental equation of void ratio (e), specific gravity (G), water content (w) and degree of saturations (S) is (CO-2)

a) e= wGS b) G=ew/s

c) e = WG/s d) S=ew/G

Q.3 Uniformity co-efficient is the ratio of (CO-3)

a) D_{10} to D_{60} b) D_{30} to D_{60}

c) D_{60} to D_{10} d) D_{60} to D_{30}

Q.4 The property of a soil which permits water to percolate through it is called (CO-4)

a) Moisture content b) Capillarity

c) Permeability d) None of these

Q.5 Neutral stress refer to (CO-5)

a) Submerged weight of soil

b) Saturated weight of soil

c) Pore water pressure

d) Minor principal stress

Q.6 Consolidation theory was given by (CO-6)

a) Skempton b) Rankine

c) Terzaghi d) Westergard

Q.7 Unconfined compression test is generally done on saturated clays for which the apparent angle of shearing resistance is (CO-7)

a) 15^0 b) 20^0

c) 30^0 d) 0

Q.8 The dry unit weight y_d is computed by the relationship. (CO-8)

A) $\gamma_d = \gamma x (1+w)$ b) $\gamma_d = \gamma/1+w)$

c) $\gamma_d = \gamma+(1+w)$ d) $\gamma_d = (1+w)/\gamma$

Q.9 Which type of sample is not generally collected in soil excavation. (CO-9)

a) Block b) Circular

c) Cylindrical d) All of these

Q.10 The pile having one or more bulbs for resisting lateral loads. (CO-11)

a) Fender pile b) Tension pile

c) Batter pile d) Under - reamed pile

SECTION-B

Note : Objective type questions. All questions are compulsory. (10x1=10)

Q.11 The black cotton soil is an example of _____ soil (CO-1)

Q.12 Phase diagram is also known as block diagram. (True/False) (CO-2)

Q.13 Particle size analysis is also known as ____. (CO-3)

Q.14 _____is used to find the coefficient of permeability of soils in the laboratory. (CO-4)

Q.15 Pore water pressure acts equally on all sides of soil particles. (True/False) (CO-5)

Q.16 Tilt is an example of _____. (CO-6)

Q.17 The shear strength equation was proposed by ____. (CO-7)

Q.18 Core-cutter method is used to calculate _____ of soil. (CO-8)

Q.19 The shape of an isobar is called_____. (CO-9)

Q20. The thin tube sampler gives _____ sample. (CO-10)

SECTION-C

Note : Short answer type questions. Attempt any twelve questions out of fifteen questions. (12x5=60)

Q.21 What do you mean by Black cotton soil & discuss their properties. Also list the major Research institution who are working on soil mechanics and foundation Engineering India. (CO-1)

Q.22 A partially saturated soil has a volume of 500 cm^3 in natural state and a weight of 800 g. After completely drying out in an oven, the dry weight is 750g. The specific gravity of soil grain is 2.70.
Calculate i) Void ratio ii) Porosity iii) Water content iv) Degree of saturation from three phase diagram. (CO-2)

Q.23 Derive relation between e(void ratio), S(degree of saturation) and w(water content). (CO-2)

Q.24 When a given sample of sand was tested in laboratory, the void ratio in the loosest and densest possible states were 0.95 and 0.40 respectively calculate i) relative density ii) degree of saturation given moisture content = 15%, unit weight of soil = 1.70g/cc and G=2.65. (CO-3)

Q.25 Explain constant head permeability method. (CO-4)

Q.26 Write a short note on the following: (CO-5)

a) Role of voids in soil mass

b) Quick sand

Q.27 Define the following (CO-6)

a) heaving

b) Consolidation settlement

c) Co-efficient of volume change

d) Secondary consolidation

Q.28 Give comparison between direct shear test and triaxial shear test. (CO-7)

Q.29 Differentiate between compaction and consolidation. (CO-8)

Q.30 What is sand drain method of compaction explain? (CO-8)

Q.31 Explain concept of vertical stress distribution in soils due to foundation loads. (CO-10)

Q.32 Give significance of Ultimate bearing capacity & net safe bearing capacity. (CO-10)

Q.33 Explain thin wall and piston samples with sketches. (CO-9)

Q.34 Explain handling of disturbed and undisturbed samples. (CO-9)

Q.35 Give the classification of piles according to function of pies. (CO-11)

SECTION-D

Note : Long Answer type question. Attempt any two questions. (2x10=20)

Q.36 a) Give concept of shallow & deep foundation. (CO-11)
b) Explain types of shallow foundations with diagram.

Q.37 Explain various methods of soil exploration. Along with their advantages and disadvantages. (CO-10)

Q.38 a) Give examples of shear failure in soils. (CO-7)
b) Explain concept of shear strength. What are the factors affecting the shear strength of soil.

Note : Course Outcome (CO) mentioned in the question paper is for official purpose only.

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180745

Sem. - 4
Branch : Civil Engineering
Sub. : Soil Mechanics & Foundation Engineering

Time : 3 Hrs. M.M. : 100

SECTION-A

Note: Multiple Choice Questions. All questions are Compulsory. (10x1=10)

Q.1 Kalonite is (CO-1)

a. Residual Soil
c. Transported Soil
b. Cohesionless soil
d. Clay mineral

Q.2 Specific gravity of soil is (CO-2)

a. Same for clay and sands
b. Determined by hydrometer
c. More than 2.45 for most soil particles
d. Less than 2.0 for most soil particles

Q.3 The minimum water content at which soil just begins to crumble into 3 mm dia. Thread is (CO-3)

a. Permeability limit
c. Plastic limit
b. Shrinkage limit
d. Consistency limit

Q.4 The hydraulic gradient (I)is given by (CO-4)

a. h x L
c. h/L
b. L/h
d. None of these

Q.5 Quick sand is (CO-5)

a. Pure silica sand
b. a quick condition in which cohesion is decreased quickly

c. A sand which can be easily compacted
d. A condition in which a cohesion less soil loses its strength because of upward flow of water

Q.6 A soil not fully consolidated under the existing overburden pressure is called (CO-6)

a. Pre-consolidated
c. Normally consolidated
b. Over-consolidated
d. Under-consolidated

Q.7 Vane shear test is used for (CO-7)

a. Sands
c. silts
b. Moderate clays
d. Soft & sensitive clays

Q.8 The process of gradual reduction in the volume of soil mass under static. (CO-8)

a. Compaction
b. Consolidation
c. Compression
d. None of these

Q.9 A spread footing which supports two or more column is (CO-11)

a. Strip footing
c. Combined footing
b. Strap footing
d. Mat footing

Q.10 Area ratio should be (CO-10)

a. Less than 5%
c. Less than 10%
b. More than 5%
d. None of these

SECTION-B

Note: Objective type Questions. All Questions are compulsory. (10x1=10)

Q.11 Aeolian deposits are formed by _____ (CO-1)

Q.12 Void ratio of coarse grained soil is ____ than the fine grained soil. (CO-2)

Q.13 Darcy's law is valid for turbulent flow. (True/False). (CO-4)

Q.14 The Curve depicting results of mechanical analysis on semi - logarithmic graph paper is called_____ (CO-3)

Q.15 Quick condition does not occur in _____ deposits. (CO-5)

Q.16 The upward movement of soil is _____ (CO-6)

Q.17 For purely cohesive soils, the angle of shearing resistance. is _____ (CO-7)

Q.18 Sheep foot rollers are suitable for compacting _____ soils. (CO-8)

Q.19 Define footing (CO-9)

Q.20 Define anchor piles. (CO-11)

SECTION-C

Note: Short Answer type Question. Attempt any twelve questions out of fifteen Questions. (12x5=60)

Q.21 What are the major soil deposits of India explain them briefly. (CO-1)

Q.22 Draw and define phase diagram. "Soil is three phase system but it becomes a two phase system under special cases" comment. (CO-2)

Q.23 Derive the relation between e (void ratio) and n (porosity of soil with the help of phase diagram. (CO-2)

Q.24 Define relative density. What is its practical utility? (CO3)

Q.25 The co-efficient of permeability of a soil sample was found out in laboratory by using falling head permeameter . Data used & the test results obtained were as follows: (CO-4)

Diameter of sample = 6 cm

Height of sample = 18 cm

Diameter of stand pipe = 2 cm

Initial head h_1 = 50 cm

Final head after3 minutes, h_2 = 30 cm

Calculate value of co-efficient of permeability.

Q.26 Define the stresses which occur in sub-soil. Give the relationship between then if any. (CO-5)

Q.27 Define the following (CO-6)

1. Rate of settlement

2. Excess pore pressure
3. Co-efficient of consolidation
4. Initial consolidation

Q.28 Define coulomb's law showing diagrammatic representation for (CO-7)

I. C-soil ii. Ø-soil iii. C-Ø-soil

Q.29 Explain O.M.C., M.D.D., Zero Air void line with the help of compaction curve. (CO-8)

Q.30 What is plate load test? Give its limitation. (CO-10)

Q.31 Write a short note on grouting and its techniques. (CO10)

Q.32 What is recovery ratio? Give its significance. (CO-9)

Q.33 Give the purpose & necessity of soil exploration. (CO-9)

Q.34 Give the classification of piles according to material and composition. (CO-11)

Q.35 Explain the different types of shallow foundations used in practice. (CO-11)

SECTION-D

Note: Long Answer Type Questions. Attempt any Two Questions out of three Questions . (2x10=20)

Q.36 What is well foundation? Give its necessity.

Explain & show various components of well foundation and its different shapes used with the help of diagram. (CO-11)

Q.37 a) Define disturbed & undisturbed samples. State their significance explain three examples for each. (CO-9)

b) Explain location, depth and spacing of soil exploration.

Q.38 Explain the Standard Proctor Test used for determining the optimum moisture content and maximum dry density of soil under normal compaction. (CO-8)

Note : Course Outcome (CO) mentioned in the question paper is for official purpose only.

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4th Sem./ Civil

Subject : Soil Mechanics and Foundation Engineering

Time : 3 Hrs. M.M. : 100

SECTION-A

Note: Multiple choice questions. All questions are compulsory (10x1=10)

Q.1 Peat is composed of

a) Clay and Sand

b) Decayed vegetable matter

c) Inorganic salt

d) Synthetic chemicals

Q.2 Mode of transportation for alluvial soils is generally

a) Wind b) Ice

c) Water d) Gravity

Q.3 Relationship between natural void ratio 'e' and porosity 'n' is

a) n = e(i +e) b) e = n (i+ n)

c) e = n (i + e) d) n = e (i + n)

Q.4 Soil is considered as:-

a) Single phase system

b) two phase system

c) three phase system

d) None of these

Q.5 The fundamental equation of void ratio 'e' specific gravity (G), water content (w) and degree of saturation (s) is:-

a) e=WGS b) G= ew/s

c) e= wG/s d) s= ew/G

Q.6 Maximum size of clay particles is :-

a) 0.002mm b) 0.04mm

c) 0.06mm d) 0.00/mm

Q.7 Plasticity Index of clay is :-

a) 0 b) <7

c) between 7 and 17 d) greater than 17

Q.8 Seepage velocity is equal to velocity of flow multiplied by:-

a) (i+e) b) e/i+e

c) i+e/e d) None of these

Q.9 Falling head permeability test is preferable when soil sample is :-

a) sandy b) clayey

c) salt sand d) sandy grovels

Q.10 Total stress is given by :-

a) -4 b) +4

c) -4 d) +4

SECTION-B

Note: Objective type questions. All questions are compulsory. (10x1=10)

Q.11 Surface ground water is also known as_____

Q.12 Creep occurs more in _____soils.

Q.13 Tilt is an example of_____.

Q.14 Unconsolidated undrained test is also known as _____test.

Q.15 The shear strength equation was proposed by_____.

Q.16 The relationship $V_d = \frac{Y}{\_\_}$

Q.17 During compaction, the voids of a soil mass _____

Q.18 Thin tube sampler given _____sample.

Q.19 A block sample is_____sample.

Q.20 Auger boring collects _____sample from the ground.

SECTION-C

Note: Short answer type questions. Attempt any twelve questions out of fifteen questions. (12x5=60)

Q.21 What is the importance of soil, profile.

Q.22 State Darcy's law.

Q.23 Write a note on seepage pressure.

Q.24 Define effective stress.

Q.25 Difference between cohension soil and cohesive soils.

Q.26 Write a note on settlement due to construction pattern.

Q.27 What is Recompression Index ?

Q.28 State the various disadvantages of triaxial test

Q.29 Write a note on vane shear test.

Q.30 What are the factors affecting the compaction

Q.31 Write a note on field compaction.

Q.32 Describe Toughness test of soil investigation.

Q.33 Explain relationship between soil properties with SPT values.

Q.34 Explain different types of shaallow foundations with its suitability.

Q.35 Explain combined footing.

SECTION-D

Note: Long answer type questions. Attempt any two questions out of three questions. (2x10=20)

Q.36 Explain standard compaction test to determine optimum moisture content.

Q.37 Explain standard penetration test (SPT)

Q.38 what is the importance of effective stress in engineering problem ?

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180745

Subject : Soil and foundation engineering

Time : 3 Hrs. M.M. : 100

SECTION-A

Note: Multiple choice questions. All questions are compulsory (10x1=10)

Q.1 CRRI is situated in:
a) Delhi b) Mumbai
c) Kolkata d) Chennai

Q.2 Loess is silty clay formed by the action of:
a) Water b) Glacier
c) wind d) Gravitational force

Q.3 Specific gravity of soil is
a) Some for clays and Sands
b) Determined by hydrometer
c) Less than 2.0 for the most soil particles
d) More than 2.45 for the most soil particles.

Q.4 The fundamental equation of void ratio 'e', specific gravity (G), water content (w) and degree of saturation (S) is:
a) e= WGS b) e=WG/S
c) G=eW/S d) S=ew/G

Q.5 Hydrometer analysis is appropriate for:-
a) Silts and Clays b) Sands and gravels
c) Peats d) All soils.

Q.6 Uniformity Co-efficient is the ratio of:
a) D10 to D60 b) D60 to D10
c) D30 to D60 d) D60 to D30

Q.7 Units of co-efficient of permeability:
a) cm b) sec/cm
c) g/cm^3 d) cm/sec

Q.8 The hydraulic gradient (i) is given by:
a) h x l b) l/h
c) h/l d) None of these

Q.9 Effective stress is also known as:
a) Principal stress b) Pore pressure
c) Intergranular stress
d) none of these

Q.10 Netural stress refers to:
a) submerged weight of soil
b) pore water pressure
c) saturated weight of soil
d) minor principal stress.

SECTION-B

Note: Objectives type questions. All questions are compulsory. 10x1=10

Q.11 Quick condition does not occur in _____ deposits.

Q.12 The increase in volume of soil mass on addition of water is _____.

Q.13 The units of coefficient of consolidation are _____.

Q.14 _____ test is used for determining shear strength of cohesive soils.

Q.15 In direct shear test, the measurement of pore water pressure is _____.

Q.16 _____ are lead to increase rate of drainage while in process of compaction.

Q.17 Core cutter method is used to calculate _____ of soil.

Q.18 The shape of an isobar is called _____.

Q.19 For chemical grouting, the chemical used is _____.

Q.20 General Exploration is called_____.

SECTION-C

Note: Short answer type questions. Attempt any twelve questions out of fifteen questions. 12x5=60

Q.21 Explain major soil deposits of India.

Q.22 Define absolute specific gravity.

Q.23 Write a note an shrinkage and swelling.

Q.24 What is an isobar?

Q.25 Write a note on Consolidometer.

Q.26 Write significance of compression Index.

Q.27 What is Consideration (Cv)?

Q.28 Explain direct shear test.

Q.29 Explain Mohr – Coulomb's failure theory.

Q.30 Describe the triaxial compression test.

Q.31 State the advantages and limitations of unconfined compression test.

Q.32 Explain dry strength test.

Q.33 Explain dilatancy test.

Q.34 What are the factors affecting bearing capacity?

Q.35 Explain palate load test.

SECTION-D

Note: Long answer type questions. Attempt any two questions out of three questions. 2x10=20

Q.36 Write a note on proctor's needle.

Q.37 Explain methods of soil exploration in detail with neat and clean diagram.

Q.38 State and explain the various shrinkage characteristics.

Q.31 Write a short note on mat foundation (CO-11)

Q.32 Write the factors to taken into consideration for the selection of the type of foundation. (CO-11)

SECTION-D

Note: Long answer type questions. Attempt any three questions. 3x10=30

Q.33 What is the shearing strength of soil along a horizontal plane at a depth of 4m in a deposit of sand having the following properties. Angle of internal friction = 350, dry unit weight = 17.09 kN/m3, specific gravity = 2.68 assume the ground water table is at a depth of 2.5m from the ground level. Also find the change in shear strength, when the water table rises up-to the ground level (CO-7)

Q.34 Enlist the various points to be taken into consideration while planning a soil exploration programme for a project and explain location, depth and spacing of bore holes. (CO-9)

Q.35 a) Write the factors affecting the bearing capacity of soils (CO-10)

b) Explain the process of determining the permeability of soils using falling head permeameter (CO-4)

Q.36 Classify the different types of piles and explain any two of them with the help of diagram. (CO-11)

(**Note:** Course outcome/CO is for office use only)

No. of Printed Pages : 4

Roll No. 180745

4th Sem. / Civil Engineering

Subject : Soil Mechanics and Foundation Engineering

Time : 3 Hrs. M.M. : 100

SECTION-A

Note: One word/Fill in the blanks/Very very short answer type questions. All questions are compulsory (10x1=10)

(Course Outcome/CO)

Q.1 Write the relationship between void ratio porosity of soils. (CO-2)

Q.2 The process of separation of given soil mass into different fractions by using a set of standard sieves is termed as _____ (CO-3)

Q.3 The numerical differences between the liquid limit and plastic limit of a soil is known as _____ (CO-3)

Q.4 The water held in the soil pores by some forces acting in the pores of soil mass is called _____ (CO-4)

Q.5 By increasing the effective stress, shear strength can be _____ (CO-5)

Q.6 The effective stress on the soil mass _____ void ratio (CO-5)

Q.7 A clayey soil has a liquid limit of 40%. The approximate value if its compression index will be _____

Q.8 Total thickness of compacted layer in which the compaction is done is known as _____(CO-8)

Q.9 If the thickness of sampling tube is increased, the disturbance of the sample will _____ (CO-9)

Q.10 The type of foundation most suitable for bridge is _____ (CO-11)

SECTION-B

Note: Very Short answer type questions. Attempt any ten parts 10x2=20

Q.11 Define water transported soils. (CO-1)

Q.12 Name any two organisations dealing with soil engineering works in India. (CO-1)

Q.13 Write any two limitations of soil engineering (CO-1)

Q.14 Define the three phase system of arrangement of constituent of soils. (CO-2)

Q.15 Define Darcy's law (CO-4)

Q.16 Define creep in soils (CO-6)

Q.17 Define sensitivity (CO-7)

Q.18 Define optimum moisture content of soil (CO-8)

Q.19 Write any two reasons for conducting soil exploration (CO-9)

Q.20 Define recovery ratio (CO-9)

Q.21 Define ultimate bearing capacity of soils (CO-10)

Q.22 Define pressure bulb (CO-10)

SECTION-C

Note: Short answer type questions. Attempt any five questions out of ten questions. 5x8=40

Q.23 Determine the void ratio and degree of saturation for a sample of silty clay having a volume of 14.39 cm^3, a total mass of 29.03 gm, a dry mass of 24.96 gm, and a specific gravity of 2.67 (CO-2)

Q.24 Write a short note on Atterberg's limits of soils (CO-3)

Q.25 Compare effective stress with neutral stress in soils (CO-5)

Q.26 Enlist the various types of settlement of soils and draw the diagrams only all of them.(CO-6)

Q.27 Write the significance of shear strength of soils. (CO-7)

Q.28 Name the factors affecting the degree of compaction of soil and explain any one of them. (CO-8)

Q.29 Write a short note on pits and trenches method of soil exploration. (CO-9)

Q.30 List out the various methods of improving the bearing capacity of soils (CO-10)