

Course Name: **Soil Mechanics and Foundation Engineering**

A. MCQS

Formative Assessment A (4 modules)	Formative Assessment B (4 modules)	Formative Assessment C (4 modules)
CU1- CU4	CU5- CU8	CU9- CU12
1.moisture content is expressed as: a) W_s/W_d b) W_w/W c) W_w/W_d d) W/W_w 2.there are ____types of specific gravity a) 2 b) 3 c) 4 d) 5 3. there are ____consistency limits a) 2 b) 3 c) 4 d) 5 4.plasticity index is a) LL-PL b) PL-LL c) W-LL d) LL+PL 5.the diameter of the thread for PL is_____mm a) 1.2 b) 2.2 c) 3.2 d) 4.2	1.In the result of compaction relieving component is a) Air b) Water c) Both air and water d) None of these 2. in the result of consolidation relieving component is a) Air b) Water c) Both air and water d) None of these 3.no of layers in standard proctor test is a) 2 b) 3 c) 4 d) 5 4. weight of rammer(pounds) in modified proctor test is a) 3 b) 5.5 c) 7.5 d) 10 5. height of fall in standard proctor test is a) 12 inches	1. Which of the following factors does NOT directly affect the bearing capacity of soil? a) Depth of foundation b) Type of soil c) Shape of the foundation d) Soil color 2. The ultimate bearing capacity of soil is the maximum pressure that can be applied without causing: a) Excessive settlement b) A permanent displacement c) Both A and B d) None of the above 3. What is the typical unit of bearing capacity? a) kg/m^2 b) kN/m^2 c) kN/m d) m^2 4. In clays, the bearing capacity generally increases with an increase in: a) Effective stress b) Depth of the foundation c) Both A and B d) Neither A nor B

6. sieve analysis is done for - Fine grains soil - Coarse grains soil - Boulders - Rocks 7. hydrometer analysis is done for - Fine grains soil - Coarse grain soil - Boulders - Rocks 8. The moisture at which soil change from semi solid to plastic state is - Shrinkage limit - Plastic limit - Liquid limit - Semi solid limit 9. The moisture at which soil change from plastic to liquid state is - Shrinkage limit - Plastic limit - Liquid limit - Semi solid limit 10. the moisture at which soil change from solid to semi solid state is - Shrinkage limit - Plastic limit - Liquid limit - Semi solid limit 11. No of blows required for the groove to be closed in liquid limit test are 15 25 35	15 inches 18 inches 20 inches 6. optimum moisture content for compaction of various soils ranges 2-4% 4-8% 8-12% 4-28% 7. which test in field is used for determining relative compaction - Standard proctor test - Modified proctor test - Sand replacement test - Standard penetration test 8. According to darcy law, relation of velocity and hydraulic gradient is - Velocity is directly proportional to hydraulic gradient - Velocity is inversely proportional to hydraulic gradient - Velocity is directly proportional to square of hydraulic gradient - None of these 9. according to Darcy law, discharge will be $Q = KVi$ $Q = KV_a$ $Q = Vi_a$ $Q = Ki_a$ 10. relation between hydraulic gradient, length and head is given by $I = h.L$ $I = h/L$ $I = L/h$	5. For a shallow foundation in cohesive soil, the bearing capacity is primarily dependent on: - Depth of the foundation - Soil type and cohesion - Shear strength of the soil - All of the above 6. Which of the following is an example of a method for calculating the bearing capacity of soil? - Terzaghi-Wegman method - Punching shear method - Plate load test - All of the above 7. In general, for cohesionless soil, the bearing capacity increases with the: - Increase in depth of the foundation - Decrease in depth of the foundation - Increase in water content - Decrease in the load 8. Which of the following is a key characteristic of a shallow foundation? - Transfers load to a deep soil stratum - Transfers load near the ground surface - Always made of concrete - Designed only for lightweight structures 9. What is the primary purpose of a shallow foundation? - To transfer building loads to deep strata - To evenly distribute loads to near-surface soil layers - To reduce construction costs - To stabilize unstable soil
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d) 45 12. the graph of sieve analysis is between - Percent passing and size - Percent passing and moisture content - Moisture content and size - Size and void ratio 13. the chemical used for speedy moisture content test is - Calcium carbide - Sodium chloride - Sodium hydroxide - Calcium carbonate 14. chemical used as dispersing agent in hydrometer analysis is - Sodium hexa-meta phosphate - Sodium chloride - Calcium carbide - Sodium carbonate 15. there are _____ types of grooving tools used in liquid limit test 2 3 4 5 16. void ratio= $n/(1-n)$ $n/(1+n)$ $(n-1)/n$ $n/(n-1)$ 17. porosity= $e/(1+e)$ $e/(1-e)$ $(1-n)/n$	d) $I = h.L$ 11. Seepage velocity is expressed as: - Discharge velocity* porosity - Discharge velocity+ porosity - Discharge velocity- porosity - Discharge velocity/porosity 12. Which has greatest permeability - Gravel - Sand - Silt - Clay 13. which has lowest permeability - Gravel - Sand - Silt - Clay 14. shearing strength of soil depends on - Cohesion - Inter-locking - Size and shape of grains - None of these 15. value of internal friction angle (ϕ) in case of clay, 0° 30° 45° 90° 16. which soil is called as c-soil - Sand - Gravel - Clay - Granular soil 17. which soil is called as (ϕ) soil - Sand	10. Which of the following is NOT a type of shallow foundation? - Strip footing - Raft footing - Pile foundation - Combined footing 11. When is a raft foundation typically used? - For single-column buildings - When loads are light - When soil has low bearing capacity - For underwater structures 12. Which shallow foundation is commonly used for supporting a single column? - Strip footing - Combined footing - Pad footing - Raft foundation 13. What is the main reason for using a combined footing? - When two or more columns are closely spaced - When soil is highly compressible - To support very light loads - To prevent water seepage 14. Which soil property is critical for designing a shallow foundation? - Soil color - Bearing capacity - Plasticity index - Grain size distribution 15. What is the main disadvantage of a shallow foundation? - High construction cost - Limited to low and moderate loads
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d) $n/(1-n)$ 18. dry density=bulk density divided by a) $1+e$ b) $1+n$ c) $1+m(\%)$ d) $1-e$ 19. which portion is removed from soil in textural classification a) Gravel b) Silt c) Clay d) sand 20. void ratio= a) Volume of void to volume of solids b) Volume of void to total volume c) Volume of air to total volume d) Total volume to volume of void 21 hydrometer analysis is done for soil pass through a) Sieve no 200 b) Sieve no 100 c) Sieve no 50 d) sieve 10 22. in determining the liquid limit the depth of the groove is a) 2 mm b) 4mm c) 5mm d) 10mm 23. the limits identifying different states of soil are called as: a) Consistency limits b) Atterberg limits c) Soil state limits	b) Gravel c) Clay d) Granular soil 18. coulomb's law is valid for a) C soil b) (ϕ) soil c) $C-(\phi)$ soil d) All of these 19.failure plane in case of shear test box test is always a) Horizontal b) Vertical c) Inclined d) None of these 20.Auger boring is used for a) Small buildings b) High rise building c) Both a and b d) None of these 21.the soil in its natural state is a) Disturbed sample b) Undisturbed sample c) Distorted sample d) None of these 22. disturbance of sample is determined by a) Area ratio b) Volume ratio c) Diameter ratio d) None of these 23.soil exploration should be done a) Before construction b) During construction c) After construction	c) Requires specialized equipment d) Cannot be used in cohesive soils 16. What is the primary purpose of a deep foundation? a) To resist lightweight loads near the surface b) To transfer heavy loads to deep soil strata or rock layers c) To minimize construction time d) To improve soil quality 17. Which of the following is NOT a type of deep foundation? a) Pile foundation b) Caisson foundation c) Raft foundation d) Pier foundation 18. When is a deep foundation typically used? a) When the soil near the surface is weak b) For small residential buildings c) When the bearing capacity of soil is high at shallow depths d) For temporary structures 19. Which type of pile transfers the load primarily through skin friction? a) End-bearing pile b) Friction pile c) Composite pile d) Floating pile 20. Which of the following is an advantage of deep foundations? a) Quick installation b) High load-bearing capacity
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d) All of these 24. size of clay in mm a) Less than 0.002 mm in diameter b) 0.002 to 0.05 mm in diameter c) 0.05 to 2.0 mm in diameter d) Larger than 2.0 mm in diameter 25. size of silt in mm a) Less than 0.002 mm in diameter b) 0.002 to 0.05 mm in diameter c) 0.05 to 2.0 mm in diameter d) Larger than 2.0 mm in diameter 26. size of sand in mm a) Less than 0.002 mm in diameter b) 0.002 to 0.05 mm in diameter c) 0.05 to 2.0 mm in diameter d) Larger than 2.0 mm in diameter 27. Size of gravel in mm a) Less than 0.002 mm in diameter b) 0.002 to 0.05 mm in diameter c) 0.05 to 2.0 mm in diameter d) Larger than 2.0 mm in diameter	d) None of these 24.how many stages are there for soil exploration a) 2 b) 3 c) 4 d) 5 25. wash boring is used for collection of a) Disturbed sample b) Undisturbed sample c) Rock sample d) None of these 26. area ratio of undisturbed soil sample is a) Equal to less than 10% b) 15% c) 18% d) Greater than 20% Answer key <table><tr><td>1) A</td><td>2) B</td><td>3) B</td><td>4)D</td></tr><tr><td>5)A</td><td>6)D</td><td>7)C</td><td>8)A</td></tr><tr><td>9)B</td><td>10) B</td><td>11) D</td><td>12) A</td></tr><tr><td>13)D</td><td>14) D</td><td>15)A</td><td>16) C</td></tr><tr><td>17) A</td><td>18) C</td><td>19)A</td><td>20)A</td></tr><tr><td>21)A</td><td>22)A</td><td>23)A</td><td>24)D</td></tr><tr><td>25)A</td><td>26)A</td><td></td><td></td></tr></table>	1) A	2) B	3) B	4) D	5) A	6) D	7) C	8) A	9) B	10) B	11) D	12) A	13) D	14) D	15) A	16) C	17) A	18) C	19) A	20) A	21) A	22) A	23) A	24) D	25) A	26) A			c) Low construction cost d) Requires less soil investigation 21. What is the primary purpose of calculating earth pressure on retaining walls? a) To design the wall thickness b) To determine the load exerted by soil on the wall c) To calculate the drainage requirements d) To estimate the wall height 22. Which of the following factors influences earth pressure on retaining walls? a) Type of soil b) Moisture content c) Angle of internal friction of soil d) All of the above 23. What type of earth pressure occurs when the retaining wall does not move? a) Active earth pressure b) Passive earth pressure c) At-rest earth pressure d) None of the above 24. In passive earth pressure, the retaining wall moves in which direction? a) Away from the soil b) Toward the soil c) Parallel to the soil surface d) No movement occurs 25. When the retaining wall moves away from the backfill, what type of earth pressure is considered? a) At-rest earth pressure b) Active earth pressure
1) A	2) B	3) B	4) D																											
5) A	6) D	7) C	8) A																											
9) B	10) B	11) D	12) A																											
13) D	14) D	15) A	16) C																											
17) A	18) C	19) A	20) A																											
21) A	22) A	23) A	24) D																											
25) A	26) A																													

Answer key:			
1.A	2.A	3.C	4.A
5.C	6.B	7.A	8.B
9.C	10.A	11.B	12.A
13.A	14.A	15.A	16.A
17.A	18.C	19.A	20.A
21.A	22.D	23.D	24.A
25.B	26.C	27.D	

c) Passive earth pressure d) Lateral earth pressure 26. Which of the following is NOT a factor affecting lateral earth pressure? a) Water table level b) Density of soil c) Elasticity of the retaining wall material d) Soil cohesion				
Answer key				
1) D	2)C	3)B	4)C	5) D
6) C	7) A	8)B	9)B	10)C
11) C	12) C	13)A	14) B	15)B
16) B	17)C	18) A	19) B	20) B
21) B	22)D	23)C	24)B	25)B
26)C				

B. Short questions

Formative Assessment A (4 modules)	Formative Assessment B (4 modules)	Formative Assessment C (4 modules)
1. What is moisture content? 2. What is specific gravity? 3. What is soil classification? 4. Enlist Atterberg limit? 5. What is shrinkage limit? 6. What is plastic limit? 7. What is liquid limit? 8. How many soils classification system are used to classify soil for civil engineering? 9. Elist soil classification system? 10. What is consistency of soil? 11. What is void ratio? 12. What is porosity? 13. What is formula for uniformity coefficient? 14. What is formula for coefficient of curvature? 15. What is degree of saturation?	1. What is compaction? 2. What is consolidation? 3. What is OMC 4. In how many layer the soil sample is compacted in modified proctor test? 5. What is the weight of rammer in standard proctor test? 6. What is the height of fall in modified proctor test? 7. What is relative compaction? 8. What is permeability? 9. State Darcy Law? 10. How many methods are there to find permeability of soil? 11. To determine permeability of coarse-grained soil which test is used? 12. To determine permeability of fine-grained soil which test is used? 13. State coulomb's law? 14. What is the relationship between moisture content and dry density? 15. What is the relationship between compactive force and dry density? 16. Enlist type of soil exploration? 17. What type of apparatus is used for shear strength of soil? 18. Enlist types of boring?	1. What is bearing capacity of soil? 2. Name a commonly used field test to determine bearing capacity. 3. what is CBR? 4. What is SPT? 5. What is SPT refusal? 6. What is the typical range of the factor of safety used for bearing capacity? 7. what is foundation? 8. enlist the types of shallow foundation? 9. enlist types of foundation? 10. enlist types of deep foundation? 11. enlist types of piles according to its load carrying nature? 12. what is end bearing pile? 13. what is friction pile? 14. enlist the types of earth pressures? 15. how many types of earth pressure are there? 16. how many theories are there for earth pressure? 17. enlist the theories for earth pressure? 18. what is active earth pressure?

16. What is gradation curve? 17. Which test is used for quick determination of moisture content? 18. Which apparatus is used for determining liquid limit of soil?		
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C. Practical task

Formative assessment(A)	Formative Assessment(B)	Formative Assessment(C)
Assessment Task no.1 For a give soil sample draw its phase diagram and determine its moisture content, specific gravity, Atterberg limits and carry out its classification Performance criteria for assessment task 01 1.Ensure ergonomic workstation setup to minimize strain during calculations and computer work. 2.Handle all measuring equipment safely to prevent injuries (e.g., sharp-edged tools/heavy tools etc.) 3.Maintain proper posture and take regular breaks to avoid repetitive strain injuries (RSIs). 4.Ensure adequate lighting and ventilation in the workspace to reduce fatigue and eye strain 5. Draw three phase diagrams of soil. 6.Identify and select apparatus for determination of moisture content / specific gravity. 7.Collect soil sample for moisture content determination 8.Determine moisture content as given by speedy moisture content.	Assessment Task no.1 Conduct soil compaction test, determine shear strength and find permeability of soil Performance criteria for assessment task 01 1.Ensure ergonomic workstation setup to minimize strain during calculations and computer work. 2.Handle all measuring equipment safely to prevent injuries (e.g., sharp-edged tools/heavy tools etc.) 3.Maintain proper posture and take regular breaks to avoid repetitive strain injuries (RSIs). 4.Ensure adequate lighting and ventilation in the workspace to reduce fatigue and eye strain 5.Collect soil sample using hand auger 6.Identify apparatus for Standard / Modified Proctor test. 7.Prepare soil sample for Standard / Modified Proctor test 8.Perform Standard / Modified Proctor test. 9.Determine optimum moisture content by plotting graph between dry density and moisture content.	Assessment Task no.1 Draw sketches of shallow foundation, deep foundation and find out coefficeints of retaining wall Performance criteria for assessment task 01 1.Ensure ergonomic workstation setup to minimize strain during calculations and computer work. 2.Handle all measuring equipment safely to prevent injuries (e.g., sharp-edged tools/heavy tools etc.) 3.Maintain proper posture and take regular breaks to avoid repetitive strain injuries (RSIs). 4.Ensure adequate lighting and ventilation in the workspace to reduce fatigue and eye strain 5.Draw sketch of isolated foundation. 6.Draw sketch of Combine foundation. 7.Draw sketch of Raft foundation. 8.Draw sketch of Eccentric foundation. 9.Draw sketch of Driven Pile.

9. Interpret moisture content corresponding to reading of dial gauge in speedy moisture tester 10. Determine moisture content by drying oven method. 11. Prepare sample and determine specific gravity 12. Apply correction factor for variation in specific gravity of water due to temperature. 13. Identify apparatus of Liquid Limit, Plastic Limit and Shrinkage limit. 14. Prepare soil sample for liquid limit Test. 15. Perform liquid limit test and record observations. 16. Determine liquid limit by plotting graph of results i.e. no. of blows and water content 17. Prepare soil sample for Plastic limit test. 18. Perform plastic limit test and determine plastic limit 19. Prepare soil sample for Shrinkage Limit test. 20. Perform Shrinkage Limit test and determine shrinkage limit 21. Identify sieves for sieve analysis. 22. Perform sieve analysis on given sample. 23. Compute percentage retained and passing in sieve analysis	10. Identify location of site for field density determination 11. Determine bulk density of soil in field by suitable method i.e. core cutter / sand replacement method. 12. Determine moisture content and dry density of field soil sample 13. Compute relative compaction 14. Identify Constant Head Permeameter for determining permeability of coarse-grained soil. 15. Collect and prepare sample of soil for test 16. Perform test and take readings. 17. Calculate coefficient of permeability by formula. 18. Identify Falling Head Permeameter for determining permeability of fine-grained soil. 19. Collect and prepare sample of soil for test 20. Perform test and take readings. 21. Calculate coefficient of permeability by formula. 22. Prepare report of test results 23. Identify apparatus for Direct Shear test for shear strength determination of soil 24. Prepare sample and perform direct shear test 25. Take readings and determine shear strength of soil	10. Draw sketch of Friction Pile, 11. Draw sketch of End-Bearing Pile. 12. Draw sketch of Sheet Pile. 13. Draw sketch of Caisson Pile. 14. Find K_A (Active earth pressure coefficient) for retaining wall when $\phi=30^\circ$? 15. Find K_p (passive earth pressure coefficient) for retaining wall when $\phi=30^\circ$?
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24.Prepare gradation curve of soil of basis of sieve analysis results 25.Calculate percentages of different soils in sample. 26.Prepare soil sample and perform Hydrometer analysis. 27.Prepare grain size gradation curve on basis of hydrometer analysis. 28.Calculate coefficient of uniformity and coefficient of curvature. 29.Classify sample using AASHTO classification system 30.Classify sample using USCS tables		
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