University of Mumbai

Program: **Civil Engineering**

Curriculum Scheme: Rev 2019

Class: TE Semester VI

Course Code: CEC603 and Course Name: Geotechnical Engg II

SAMPLE QUESTION BANK

Multiple Choice Questions (2 marks each)

1.	Coefficient of consolidation of a soil is affected by
Option A:	Compressibility and Permeability
Option B:	Compressibility only
Option C:	Permeability only
Option D:	Compaction
2.	During one consolidation test, it is observed that when the load was changed from 60 KN /m^2 to 120 KN/m^2, the void ratio changed from 0.75 to 0.65.Find the coefficient of Compressibility.
Option A:	0.167 m^2/KN
Option B:	0.00167 m^2/KN
Option C:	0.0167 KN/m^2
Option D:	0.167 m^3/KN
3.	Mohr envelope can be considered to be straight if the angle of internal friction φ is assumed to be _____
Option A:	0º
Option B:	90º
Option C:	> 90º
Option D:	< 90º
4.	In the friction circle method of slope stability analysis, if *R* is the radius of the slip circle, what will be the radius of friction circle ?
Option A:	R
Option B:	R sin ϕ
Option C:	R cos ϕ
Option D:	R tan ϕ
5.	A long natural slope of cohesion-less soil is inclined at 10° to the horizontal. What will be the factor of safety of the slope if φ = 25°?
Option A:	2.5
Option B:	0.45
Option C:	2.19
Option D:	1.22
6.	A vertical cut is to be made in a soil mass with cohesion c, angle of internal

	friction φ, and unit weight γ . Considering K_a and K_p as the coefficients of active and passive earth pressures, respectively, the maximum depth of unsupported excavation is
Option A:	$\frac{4c\sqrt{K_a}}{\gamma}$
Option B:	$\frac{4c}{\gamma\sqrt{K_a}}$
Option C:	$\frac{2c\sqrt{K_p}}{\gamma}$
Option D:	$\frac{4c}{\gamma\sqrt{K_p}}$
7.	If the dry cohesion less backfill carries a uniform surcharge q and unit weight γ , then the active earth pressure intensity at the top of wall is _____
Option A:	p_a=Ka q
Option B:	pa=Ka γz / Ka q
Option C:	pa=Ka γz - Ka q
Option D:	pa=Ka γz + Ka q
8.	The percentage reduction in the bearing capacity of a strip footing resting on sand when the water level is at the base of the footing and when the water level is at a depth much greater than the width of footing, is approximately
Option A:	5
Option B:	25
Option C:	50
Option D:	75
9.	The plate load test was conducted on clayey strata by using a plate of 0.45 m × 0.45 m dimensions, and the ultimate load per unit area for the plate was found to be 200 KPa. The ultimate bearing capacity of a 2.2 m wide square footing would be
Option A:	180 KPa
Option B:	450 KPa
Option C:	220 KPa
Option D:	200 KPa
10.	A square pile 300 mm size penetrates soft clay with cohesion of 85 KPa and a depth of 18 m and rest on stiff soil. Determine the capacity of pile by skin friction. Assume an adhesion factor of 0.75
Option A:	1085 KN
Option B:	1377 KN
Option C:	1550 KN
Option D:	1455 KN
11.	The coefficient of compressibility of soil, is the ratio of
Option A:	Stress to strain

Option B:	Strain to stress
Option C:	Stress to settlement
Option D:	Rate of loading to that of settlement.
12.	A direct shear test was conducted on cohesion less soil specimen under a normal stress of 200kN/m^2. The specimen failed at a shear stress of 100kN/m^2. The angle of internal friction of the soil is
Option A:	26.6
Option B:	29.5
Option C:	30
Option D:	32.6
13.	Tailors stability charts are based on the total stressed using the
Option A:	Friction circle method
Option B:	Method of slices
Option C:	Swedish circle method
Option D:	Colum's method
14.	Basement walls are generally designed for
Option A:	Active pressure
Option B:	Passive pressure
Option C:	At rest pressure
Option D:	Lateral pressure
15.	The minimum allowable factor of safety against sliding
Option A:	1.5
Option B:	2
Option C:	2.5
Option D:	3
16.	According to Rankines formula the minimum depth of foundation, when q= 180kN/m^2, γ =20kN/m^3 and φ= 30^0
Option A:	0.5m
Option B:	1m
Option C:	1.5m
Option D:	2m
17.	The coefficient of sub grade reaction is not depend upon
Option A:	The size of footing
Option B:	The shape of footing
Option C:	The depth of footing
Option D:	Water table
18.	What is gross bearing capacity of strip footing 2m wide location at a depth of 2.5m clay is 500kN/m^2, its net bearing capacity for γ= 25kN/m^2 .
Option A:	457.5kN/m^2
Option B:	437.5kN/m^2
Option C:	340kN/m^2
Option D:	360kN/m^2

19.	A 30 cm diameter pile is driven in a normally consolidated clay deposit 15m thick, estimate the safe load. Take Cu = 70kN/m^2, α = 0.9 and F.S. = 2.5
Option A:	375kN
Option B:	400kN
Option C:	425kN
Option D:	450kN
20.	Precast concrete pile is driven with a 50kN hammer, having a free fall of 1m , if the penetration in the last blow is 0.5cm. Determine the load carrying capacity of the pile using engineering news record formula. Take F.S. 6.
Option A:	270kN
Option B:	274kN
Option C:	280kN
Option D:	290kN
21.	For a particular loading condition unsaturated clay layer undergoes 36 % consolidation during a period of 150 days. What will be the additional time required for further 14 % consolidation to occur.
Option A:	139 days
Option B:	229 days
Option C:	339 days
Option D:	319 days
22.	The shear strength in cohesion less soil is due to _____
Option A:	cohesion
Option B:	Internal friction
Option C:	Cohesion and friction
Option D:	Intergranular friction
23.	If the characteristics of soil at all identical depths below the ground surface are constant or same , it is a _____
Option A:	Finite slope
Option B:	Infinite slope
Option C:	Identical surface
Option D:	Failure surface
24.	Originally, Rankine's lateral earth pressure theory was be applied to only _____
Option A:	Layered soil
Option B:	Cohesive soil
Option C:	Cohesion less soil
Option D:	Fine grained soil
25.	The wedge theory of earth pressure is based on the concept of _____
Option A:	Active earth pressure
Option B:	Passive earth pressure
Option C:	Sliding wedge
Option D:	Wall friction
26.	Which of the following is not a failure of retaining wall?
Option A:	sliding

Option B:	overturning
Option C:	crushing
Option D:	Stone pitching
27.	Which of the following is a characteristic of general shear failure?
Option A:	Bulging of shearing soil mass
Option B:	Failure is accompanied by compressibility of soil
Option C:	Shocking failure
Option D:	Sudden failure
28.	According to Terzaghi ‘s theory, the bearing capacity for purely cohesive soil is given by the equation _____
Option A:	$qf = 5.7\ c + \bar{\sigma}$
Option B:	$qf = 5.7\ c$
Option C:	$qf = c + \bar{\sigma}$
Option D:	$qf = 7.5\ c$
29.	The group efficiency of pile group mainly depends upon _____
Option A:	Bearing capacity of soil
Option B:	Type of soil
Option C:	Loading
Option D:	Characteristic of pile and Spacing of pile
30.	In bored pile, concreting is done by using _____
Option A:	Concrete plug
Option B:	Casing tube
Option C:	Under-reamer
Option D:	Auger

5 Marks Questions

1) Explain briefly cyclic pile load test.
2) Explain pre consolidation pressure with appropriate figure
3) What is the effect of ground water table on the baring capacity of soil?
4) Compare general shear, local shear and punching shear failure in detail.
5) Define Initial consolidation, Primary consolidation and Secondary consolidation.
6) Explain Taylor’s stability Number to analyze stability of slopes
7) Explain Swedish Circle Method for cohesive soil for stability analysis of slopes.
8) Compare Rankine’s and Coulombs lateral earth pressure theory
9) What are the factors affecting shear strength of soil?
10) Explain Dyanamic Formulae for analyzing the load carrying capacity of Piles?
11) Write short note on factors influencing bearing capacity of soil.
12) What are the causes and effects of Negative skin friction? Explain the remedial measures to minimize it.
13) Explain The Limitations of Plate Load Test

10 Marks Questions

1) Derive the relationship between the principal stresses at failure usingMohr Coulomb failure criteria with usual notations.
   $\sigma'_1 = \sigma'_3 N\Phi + 2c'\sqrt{N\Phi}$
2) A layer of soft clay is 7 m thick and lies under a newly constructed building. The weight of sand overlying the clayey layer produces a pressure of 240kN/m^2 and the new construction increases the pressure by 100kN/m^2. If the compression index is 0.45, compute the settlement. Water content is 41% and specific gravity of grains is 2.65
3) A retaining wall with a vertical back 6m high supports cohesion less backfill of unit weight of 19 kN/m3. The upper surface of the backfill rises at an angle of 100 with the horizontal from the crest of the wall . The angle of internal friction for the soil is 310, and the angle of wall friction is 220. Determine the total active pressure per linear meter of the wall and mark the direction and point of application of the thrust. Use Rebhann's Graphical Method.
4) A retaining wall having smooth vertical back is retaining purely cohesive soil. Calculate the depth at which the intensity of active pressure is zero. Consider height of wall=13 m, C=40 KN/m2, γ =20 KN/m3. What will be the critical depth of excavation in this soil?
5) A square column foundation is to be designed for a gross allowable total load of 320kN. If the load is inclined at an angle of 180 to the vertical. Determine the width of the foundation. Take a factor of safety of 3.0 and use Vesic's equation. γ =18 kN/m^3, ϕ=320, C= 15 kN/m^2 .The depth of foundation is 1.0m. Bearing capacity factors are Nc=45, Nq=33, Nγ=47
6) Explain Pile Load Test and the interpretation of data from the test
7) A 20meter thick isotropic clay stratum overlies an impervious rock. The coefficient of consolidation (C_v) is 5x10^{-4} cm^2/sec, find the time required for 50% and 90% consolidation. Also explain Spring Analogy in consolidation.
8) A 7 m retaining wall with a smooth vertical back face has a stratified backfill and a surcharge load of 10 Kpa. The properties of soil are as follows: up to 3.5 m height from top:- unit weight 15 kN/m^3 , angle of shearing resistance = 30^0 and cohesion = 0. Below 3.5 m level:- unit weight 20kN/m^3 , angle of shearing resistance = 10^0 and cohesion = 10 kpa. Draw the lateral earth pressure diagram and estimate the resultant thrust on the wall and its position.
9) Explain in detail Swedish circle method.
10) What are retaining walls, types of retaining walls, explain stability checks for retaining walls.
11) A square column foundation is to be designed for a gross allowable total load of 250 kN. If the load is inclined at an angle 15^0 to the vertical, determine the width of the foundation. Take factor of safety of 3and use Vesic's equation. Υ = 19 kN/m 3 , $\varphi = 35^0$, c = 5 kN/m^2 . The depth of the foundation is 1 m. (N_c = 46.12, N_q = 33.33, N_Υ = 48.03)

12) A concrete pile 350 mm diameter is driven into dense sand for a depth of 8.5. Estimate: (i) The safe load acting on the pile. (ii) Safe load if the water table exists at 2 m below the ground surface. Consider following properties of the sand: angle of internal friction = 35^0 , unit weight = 20 kN/m^3 , coefficient of friction between sand and pile = 0.7, coefficient of earth pressure = 1
13) A nine pile group arranged in a square pattern is used as a foundation for a column in sand (for $\varphi = 32^0$, Nq = 27). Piles 300 mm in diameter and 10 m in length are placed at a spacing of900 mm in each direction. Calculate the ultimate load capacity of the pile group. Assume the unit weight of the soil as 18 kN/m^3. Show the arrangement of piles.

14) Explain Triaxial compression test in detail
15) A square footing is located at a depth of 1.3 m below ground has to carry a safe load of 800 kN. Find the size of the footing, if the desired factor of safety is 3. The soil has the following properties: void's ration = 0.55, degree of saturation = 50%, sp. gravity = 2.67, c = 8 kN/m^2 , $\varphi = 30^0$, Nc =37.2, Nq = 22.5, N_Υ = 19.7. Use Terzaghi's analysis.

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