INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

ASSIGNMENT

Course Name	:	**Foundation Engineering**
Course Code	:	A60126
Class	:	III B.Tech II Semester
Branch	:	Civil Engineering
Year	:	2017 - 2018
Course Coordinator	:	Mr. Y Ravi Kumar, Assistant Professor, Department of Civil Engineering.
Course Faculty		Mr. Y Ravi Kumar, Assistant Professor, Department of Civil Engineering.

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT-I **SOIL EXPLORATION**		
1	Differentiate between undisturbed and disturbed soil samplers.	Understand	1
2	Sketch a split spoon sampler and explain its parts in brief.	Understand	2
3	Write a short note on geophysical exploration using electrical resistivity.	Remember	3
4	What are the merits and demerits of split spoon sampler?	Remember	2
5	What is N-value of standard penetration test?	Remember	3
6	Compute the area ratio of a thin walled tube samples having an external diameter of 6cm and a wall thickness of 2.25mm. Do you recommend the sampler for obtaining Undisturbed soil samplers? Why?	Remember	2
7	Explain various methods of soil exploration and comment on suitability of each of them.	Remember	3
8	Explain and discuss the various factors that help decide the number and depth of bore holes required for subsoil exploration.	Remember	3
9	Describe open driven, piston and rotary samplers with neat sketches.	Remember	3
10	A SPT was performed at a depth of 20m in a dense sand deposit with a unit weight of 17.5kN/m^2. If the observed N-value is 48, what is the N-value corrected for overburden?	Understand	2
	UNIT-II **SLOPE STABILITY**		
1	Explain method of slices for stability analysis of slope	Remember	4
2	Describe a suitable method of stability analysis of slopes in purely saturated cohesive soil.	Remember	4
3	Under what conditions (i) a base failure and (ii) a toe failure are expected?	Remember	4

	Explain.		
4	Compare the Swedish arc circle method with method of slices.	Remember	4
5	Write brief notes on Taylor's stability number.	Remember	5
6	An excavation has to be made with an inclination of 40° in a soil with c' = 40kPa, phi = 10°, 30kN/m^3, Φ = 20°, factor of safety for passive resistance = 2. Use Terzaghi γ = 18kN/m^3. What is the maximum height of the slope with a factor of safety of 2.0. The Taylor's stability number for the above condition is given as 0.097.	Understand	4
7	Explain Bishop's simplified method for determination of factor of safety of a finite slope.	Understand	4
8	Explain the method of slices for estimation of factor of safety of finite slopes. Also, obtain the expression for factor of safety of a c – Φ.		5
9	It is proposed to construct a highway embankment using a c-ϕ soil having c = 25kPa, Φ= 20°, γ = 17kN/m^3. Determine the critical height up to which the embankment can be built with an inclination of 30° with a factor of safety of 1.50. Given the Taylor's stability number for these conditions as 0.0737.	Understand	5
10	Explain the method of slices for estimation of factor of safety of finite slopes.	Remember	4
	UNIT-III **EARTH PRESSURE THEORIES**		
1	What are the assumptions made in Coulomb's theory?	Remember	7
2	Distinguish between active and passive pressures.	Remember	7
3	Explain the earth pressure in active, passive and at rest conditions.	Remember	7
4	Write notes on Coulomb's earth pressure theory.	Remember	7
5	What are the assumptions made in Rankine's theory of earth pressure?	Remember	8
6	Describe Culmann's graphical method of finding earth pressure and explain the classical theory of earth pressure on which this procedure is based. Explain how surcharge will affect earth pressure in active and passive states.	Remember	7
7	With the aid of Mohr's circle diagram, explain what is meant by active and passive Rankine states in cohesion less soil with a horizontal surface. Hence obtain an expression for the intensity of active earth pressure behind a vertical wall and explain why for this condition there is an implied assumption of smooth wall.	Understand	7
8	A masonry retaining wall with vertical back has to retain a backfill of 6m height behind it. The ground level is horizontal at the top and the water table is up to the top of backfill. Assume unit saturated weight of backfill soil = 19kN/m^3, c = 0, Φ = 30°. Calculate the horizontal earth pressure on wall if wall moves towards the backfill.	Understand	7
9	A 8m high retaining wall is supporting a c – Φ backfill having c = 30kN/m^2; Φ = 24°; γ = 18kN/m^3. Plot the distribution of active and passive earth pressure and determine the magnitude and point of application of total active and passive earth pressure acting on the retaining wall.	Understand	7
10	A 9m high retaining wall is supporting a backfill consisting of two types of soils. The water table is located at a depth of 5m below the top. The properties of soil from 0 to3m include c = 0kN/m^2; Φ = 33°; γ = 17kN/m^3 and those for soil from 3m to 9m include c = 0kN/m^2; Φ = 40°; γ = 18.50kN/m^3; γ_{sub} = 20.50kN/m^3.Plot the distribution of active and passive earth pressure and determine the magnitude and point of application of total active and passive earth pressure acting on the retaining wall.	Understand	8
	RETAINING WALLS		
1	Describe the various methods used for draining backfills.	Remember	9
2	Distinguish between counter fort and buttress retaining walls.	Remember	9
3	Discuss the stability of retaining walls against sliding.	Remember	9

4	Explain the significance of weep holes in performance of retaining walls.	Remember	9
5	Describe gravity and semi-gravity retaining walls.	Remember	9
6	A trapezoidal masonry retaining wall 1 m wide at top and 3 m wide at its bottom is 4m high. The vertical face is retaining soil ($\Phi = 30°$) at a surcharge angle of 20° with the horizontal. Determine the maximum and minimum intensities of pressure at the base of the retaining wall. Unit weights of soil and masonry are 20kN/m^3 and 24kN/m^3 respectively. Assuming the coefficient of friction at the base of the wall as 0.45, determine the factor of safety against sliding. Also determine the factor of safety against overturning.	Understand	9
7	Describe the various methods used for drainage of the backfill.	Remember	9
8	Discuss the stability of retaining walls against bearing capacity.	Remember	9
9	Design a gravity retaining wall of height 3m with uniform thickness (i.e. rectangular in cross section) constructed in RRM with a unit weight of 24kN/m^3. The average properties of soil from top to bottom of wall include c = 0kN/m^2; Φ=36°; γ =18kN/m^3; the friction angle is 2/3 of Φ. The allowable bearing capacity of the soil for this case is found to be 200kN/m^2. Analyze the stability of the wall against overturning, sliding and bearing capacity.	Understand	9
10	Discuss the stability of retaining walls against overturning.	Understand	9
UNIT-IV SHALLOW FOUNDATIONS- BEARING CAPACITY CRITERIA			
1	Enumerate the differences between Terzaghi's and Meyerhof's bearing capacity theories.	Remember	10
2	What are the assumptions made in Terzaghi's bearing capacity theory?	Remember	11
3	What is raft footing? What are its types?	Remember	10
4	Make a note on combined footing and its types.	Remember	10
5	Enumerate the various types of shallow foundations.	Remember	10
6	Design a strip footing for load bearing wall transmitting a force of 200kN/m proposed to be laid at a depth of 1.50 m below the G.L on a c- Φ soil with c =40 kPa and Φ=20° , γ =17kN/m3. Given NC=11.80, Nq=3.90, N γ =1.70.	Understand	11
7	Write the expressions for Ultimate bearing capacity of soil for strip footing for local shear failure. Also derive its net ultimate bearing capacity and factor of safety.	Remember	11
8	Make a note on Meyerhof and Skempton method for safe bearing capacity.	Remember	11
9	It is proposed to lay a suitable type of foundation at a depth of 1.5 m below the ground level on soil a c-ö soil with c =30 KPa and Φ =25^0 , γ = 17.50 kN/m^3. Given N_C' =14.80, N_q' =5.60, N γ^1 = 3.20. Estimate the ultimate bearing capacity of a I. 2 m wide strip footing II. 2m wide square footing III. 2m wide circular footing.	Understand	12
10	Explain spread footing with detailed sketch.	Remember	13
SHALLOW FOUNDATIONS - SETTLEMENT CRITERIA			
1	What are the various types of settlements in foundations?	Remember	12
2	What are the types of settlements caused due to loads?	Remember	13
3	What are the types of settlements which are caused due to reasons other than loads?	Remember	12
4	Make a note on plate load test.	Remember	12
5	What are the objectives of proportioning of footing?	Remember	13
6	Differentiate between total settlement and differential settlement. What are the harmful effects of differential settlement on structures? What are the possible remedial measures?	Remember	13
7	How does the construction period affect the time-rate of settlement of a structure? What is the effective loading period?	Remember	13
PILE FOUNDATION			

1	Define pile foundation. When are pile foundations preferred?	Remember	14
2	Explain the settlement analysis of piles in short.	Remember	14
3	Write a note on dynamic formula of piles.	Remember	14
4	Distinguish between driven and bored piles. Explain why the settlement of a pile foundation (pile group) will be many times that of a single pile even though the load per pile on both cases is maintained the same.	Remember	14
5	Give a method to determine the bearing capacity of a pile in clay soil. What is group effect and how will you estimate the capacity of a pile group in clay?	Remember	14
6	What are the various methods used for determining the capacity of (*i*) a driven pile and (*ii*) a cast-in-situ pile?	Remember	14
7	A square pile 25 cm size penetrates soft clay with unit cohesion of $75kN/m^2$ for a depth of 18 m and rests on stiff soil. Determine the capacity of the pile by skin friction. Assume an adhesion factor of 0.75.	Understand	14
8	A square pile group of 9 piles of 25 cm diameter is arranged with a pile spacing of 1m. The length of the piles is 9 m. Unit cohesion of the clay is $75kN/m^2$.Neglecting bearing at the tip of the piles determine the group capacity. Assume adhesion factor of 0.75.	Remember	14
9	Determine the group efficiency of a rectangular group of piles with 4 rows, 3 piles per row, the uniform pile spacing being 3 times the pile diameter. If the individual pile capacity is 100kN, what is the group capacity according to this concept?	Understand	14
	UNIT-V **WELL FOUNDATION**		
1	What is the procedure for sinking of pneumatic caisson?	Remember	15
2	A cylindrical well of external diameter 6 m and internal diameter 4 m is sunk to a depth 16 m below the maximum scour level in a sand deposit. The well is subjected to a horizontal force of 1000kN acting at a height of 8 m above the scour level. Determine the total allowable equivalent resisting force due to earth pressure, assuming that (*a*) the well rotates about a point above the base, and (*b*) the well rotates about the base. Assume $\gamma=10kN/m^3$, = 30°, and factor of safety against passive resistance = 2. Use Terzaghi's approach.	Understand	15
3	A circular well of 6m external diameter and 4m internal diameter is embedded to a depth of 15m below the maximum scour level in a sandy soil deposit. The well is subjected to a horizontal force of 800kN acting at a height of 8m above the scour level. Determine the allowable total equivalent resisting force due to the earth pressure assuming the rotation is about a point above the base. Take γ_{sat} = $30kN/m^3$, Φ = 20°, factor of safety for passive resistance = 2. Use Terzaghi's analysis.	Understand	15
4	What is the procedure for sinking of pneumatic caisson?	Remember	15
5	With neat sketch, explain the components of pneumatic caisson.	Remember	15
6	With neat sketch, explain the components of open caisson.	Remember	15
7	What is a 'Floating Caisson'? How is its stability checked? What are the merits and demerits of a Floating Caisson when compared with other types?	Remember	15
8	Sketch and describe the various components of a well foundation, indicating the function of each.	Remember	15
9	Discuss the construction aspects of Well Foundations. What are 'Tilts and Shifts'? What are the remedial measures to control these?	Remember	15
10	Explain an 'Open Caisson' with a neat sketch showing all the component parts. How is the load-carrying capacity of an Open Caisson determined? What are the merits and demerits of an Open Caisson?	Remember	15

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