P P SAVANI UNIVERSITY

Fifth Semester of B. Tech. Examination

December 2021

SECV3011 Soil Mechanics & Foundation Engineering

2.12.2021, Thursday **Time: 09:00 a.m. To 11:30 a.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 Answer the Following. (Any Five) **[05]**

(i) For Modified compaction test done on soil, the mass and drop of hammer are _____
(a)5.4 kg and 450 mm (b)2.60 kg and 310 mm (c)2.6 kg and 450 mm

(ii) What is consolidation?

(iii) Triaxial test use for which kind of soil?

(iv) Minor principal stress in a soil is represented by the symbol _____
(a) $\sigma 1$ (b) $\sigma 3$ (c) $\sigma 2$

(v) In a compaction test, as the compaction effort is increased, the maximum dry density _____
(a) decreases (b) remain same (c)increases

(vi) Define shear strength of soil.

(vii) Between what the virgin compression curve is a curve?
(a) the voids ratio and the effective pressure
(b) the effective pressure and the total pressure
(c) the effective pressure and the pore pressure

Q - 2 (a) In a soil compaction test following results were obtained. **[05]**

Moisture Content, %	8.8	9.6	12	15	18	21
Bulk Density, kN/m3	12.62	13.19	15.6	17.2	17.5	17.0

Plot compaction curve and obtain OMC & MDD.

Q - 2 (b) List out different type of rollers and explain any two types. **[05]**

OR

Q - 2 (a) In a consolidation test, the void ration of the specimen which was 1.068 under the effective stress of 214 kN/m2, changed to 0.994 when the pressure was increased to 429 kN/m^2. Calculate the co-efficient of compressibility, compression index and the co-efficient of volume compressibility. Find the settlement of the foundation resting on above type of clay, if thickness of the layer is 8m and the increase in pressure is 10 kN/m^2. **[05]**

Q - 2 (b) A MDD and OMC of soil from standard proctor test are 18kN/m3 and 16% respectively. Compute degree of saturation of sample. Assume G = 2.68 **[05]**

Q - 3 (a) Describe Box shear test. **[05]**

Q - 3 (b) A standard specimen of cohesion less sand was tested in triaxial compression and the sample failed at a deviator stress of 482 kN/m^2, when the cell pressure was 100 kN/m^2, under drained condition. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the major principal stress at failure for another identical specimen of sand it is tested under a cell pressure of 200 kN/m^2? **[05]**

OR

Q - 3 (a)	Explain different drainage condition applied in the shear test.	**[05]**
Q - 3 (b)	Define coefficient of compressibility and coefficient of volume change with equation.	**[05]**
Q - 4	Attempt any one/two.	**[05]**
(i)	In a consolidation test, the void ration of the specimen which was 1.068 under the effective stress of 214 kN/m^2, changed to 0.994 when the pressure was increased to 429 kN/m^2. Calculate the co-efficient of compressibility, compression index and the co-efficient of volume compressibility. Find the settlement of the foundation resting on above type of clay, if thickness of the layer is 8m and the increase in pressure is 10 kN/m^2.	
(ii)	Differentiate the consolidation and compaction of soil.	

SECTION – II

Q - 1	Answer the Following. (Any Five)	**[05]**
(i)	The coefficient of active earth pressure is _____ the coefficient of passive pressure. (a) less than (b) greater than (c) equal	
(ii)	What are the types of shear failure?	
(iii)	The action of negative skin friction on the pile is to _____ (a) reduce the allowable load on the pile (b) increase the ultimate load on the pile (c) reduce the settlement of the pile	
(iv)	Define ultimate bearing capacity?	
(v)	According to Rankin's theory the value of 'c' for cohesion less soil is _____ (a) 0 (b) 0.5 (c) 1	
(vi)	Sheet piles are commonly used as _____ in hydraulic structure. (a)Bulk heads (b) Bearing stratum (c) Boulders	
(vii)	Define differential settlement.	
Q - 2 (a)	Explain the Rankine's theory of passive earth pressure for cohesionless backfill.	**[05]**
Q - 2 (b)	A retaining wall 10 m high retains a cohesionless soil having an angle of internal friction of 35 degree. The surface of the soil is level with the top of the wall. The top 3 m of the fill has a unit weight of 16 kN/m^3 and that of the rest is 20 kN/m^3. Find the magnitude per meter run and point of application of the resultant active thrust. Assume Φ the same for both strata.	**[05]**

OR

Q - 2 (a)	Discuss the different bearing capacity failures of footing.	**[05]**
Q - 2 (b)	Write the assumption and limitations of Terzaghi's bearing capacity theory.	**[05]**
Q - 3 (a)	Write a note on "Pile load test".	**[05]**
Q - 3 (b)	Write short note on Negative skin friction in Pile.	**[05]**

OR

Q - 3 (a)	What is gross bearing capacity? Explain total and differential settlement.	**[05]**
Q - 3 (b)	Write short note on coulomb's wedge theory.	**[05]**
Q - 4	Attempt any one/two.	**[05]**
(i)	Discuss the criteria to select the location and depth of shallow foundation.	
(ii)	Differentiate the friction piles and end bearing piles.	

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3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1	Answer the Following. (Any Five)	**[05]**
(i)	Equation to find coefficient of active earth pressure is _____.	
(ii)	Define general shear failure?	
(iii)	The action of negative skin friction on the pile is to _____ (a) reduce the allowable load on the pile (b) increase the ultimate load on the pile (c) reduce the settlement of the pile	
(iv)	Define net ultimate bearing capacity?	
(v)	According to Rankin's theory the value of 'c' for cohesion less soil is _____ (a) (a) 0 (b) 0.5 (c) 1	
(vi)	Define fender pile.	
(vii)	Between what the virgin compression curve is a curve? (a) the voids ratio and the effective pressure (b) the effective pressure and the total pressure (c) the effective pressure and the pore pressure	
Q - 2 (a)	Explain the test procedure of standard proctor test.	**[05]**
Q - 2 (b)	Discuss the different factor affecting compaction of the soil.	**[05]**
	OR	
Q - 2 (a)	An undisturbed sample of a clay stratum, 2 m thick, was tested in the laboratory and the average value of coefficient of consolidation was found to be $2 * 10^{-4}$ cm^2/sec. If a structure is built on the clay stratum, how long will it take to attain half the ultimate settlement under the load of the structure? Assume double drainage.	**[05]**
Q - 2 (b)	Explain the Terzaghi's spring analogy theory	**[05]**
Q - 3 (a)	Describe Vane shear test.	**[05]**
Q - 3 (b)	A standard specimen of cohesion less sand was tested in triaxial compression and the sample failed at a deviator stress of 482 kN/m^2, when the cell pressure was 100 kN/m^2, under drained condition. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the major principal stress at failure for another identical specimen of sand it is tested under a cell pressure of 200 kN/m^2?	**[05]**
	OR	
Q - 3 (a)	Explain different drainage condition applied in the shear test.	**[05]**
Q - 3 (b)	Define coefficient of compressibility and coefficient of volume change with equation.	**[05]**
Q - 4	Attempt any one.	**[05]**
(i)	Describe Logarithm of time fitting method.	
(ii)	Differentiate the consolidation and compaction of soil.	

SECTION – II

Q - 1	Answer the Following. (Any Five)	**[05]**
(i)	The coefficient of active earth pressure is _____ the coefficient of passive pressure.	

(a) less than (b) greater than (c) equal

(ii) What are the types of shear failure?

(iii) The action of negative skin friction on the pile is to _____
(a) reduce the allowable load on the pile (b) increase the ultimate load on the pile
(c) reduce the settlement of the pile

(iv) Define ultimate bearing capacity?

(v) According to Rankin's theory the value of 'c' for cohesion less soil is _____
(a) 0 (b) 0.5 (c) 1

(vi) Sheet piles are commonly used as _____ in hydraulic structure.
(a)Bulk heads
(b) Bearing stratum
(c) Boulders

(vii) Define differential settlement.

Q - 2 (a) Explain difference between active & passive earth pressure. **[05]**

Q - 2 (b) A retaining wall 10 m high retains a cohesionless soil having an angle of internal friction of 35 degree. The surface of the soil is level with the top of the wall. The top 3 m of the fill has a unit weight of 16 kN/m^3 and that of the rest is 20 kN/m^3. Find the magnitude per meter run and point of application of the resultant active thrust. Assume Φ the same for both strata. **[05]**

OR

Q - 2 (a) Discuss the different bearing capacity failures of footing. **[05]**

Q - 2 (b) Write the assumption and limitations of Terzaghi's bearing capacity theory. **[05]**

Q - 3 (a) Write a note on "Pile load test". **[05]**

Q - 3 (b) What are the factors affecting of pile foundation? **[05]**

OR

Q - 3 (a) What is gross bearing capacity? Explain total and differential settlement. **[05]**

Q - 3 (b) What are the assumptions of Rankine's theory? **[05]**

Q - 4 Attempt any one. **[05]**

(i) Define critical depth.

(ii) Differentiate the friction piles and end bearing piles. Show the earth pressure distribution for submerged backfill

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