GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

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Registration No: | | | | | | | | | | |

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4th Semester Regular Examination-April-May 2019

BCEPC4010 – GEOTECHNICAL ENGINEERING-I

(Regulations 2017) CIVIL ENGG.

Time : 3 Hours Maximum : 100 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) 10 x 2=20 Mark

Q.1. Answer All Questions.

a Which of the following types of soil is transported by gravitational forces? [CO1] [PO1]

a) loess b) talus c) drift d) dune sand

b A soil has a bulk density of 22 kN/m^3 and water content 10 %. The dry density of soil is [CO1] [PO1]

a) 18.6 kN/m^3 b) 20.0 kN/m^3 c) 22.0 kN/m^3 d) 23.2 kN/m^3

c Toughness index is defined as the ratio of [CO2] [PO1]

a) plasticity index to consistency index b) plasticity index to flow index

c) liquidity index to flow index d) consistency index to liquidity index

d The hydraulic head that would produce a quick condition in a sand stratum of thickness 1.5 m, [CO2] [PO2]

specific gravity 2.67 and voids ratio 0.67 is equal to

a) 1.0m b) 1.5 m c) 2.0 m d) 3m

e An uniformly distribute line load of 500 kN/m is acting on the ground surface. Based on [CO3] [PO2]

Boussinesq's theory the ratio of vertical stress at a depth 2 m to that at 4 m, right below the line of loading is a) 0.25 b) 0.25 c) 2.0 d) 4.0

f The maximum vertical stress on a vertical plane due to point load Q at depth Z is given by [CO3] [PO3]

a) 0.1332 Q/Z^2 b) 0.9875 Q/Z^2 c) 0.2568Q/Z^2 d) 0.0875Q/Z^2

g Coefficient of consolidation of a soil is affected by [CO4] [PO4]

a) compressibility b) permeability c) both compressibility and permeability d) none of the above

h Time factor for a clay layer is [CO4] [PO4]

a) a dimensional parameter b) directly proportional to permeability of soil

c) inversely proportional to drainage path d) independent of thickness of clay layer

i A cylindrical specimen of saturated soil failed under an axial vertical stress of 100kN/m2 when it was laterally unconfined. The failure plane was inclined to the horizontal plane at an angle of 45°. The values of cohesion and angle of internal friction for the soil are respectively [CO5] [PO5]

a) 0.5 N/mm^2 and 30° b) 0.05 N/mm^2 and 0° c) 0.2 N/mm^2 and 0° d) 0.05 N/mm^2 and 45°

j The shear strength of a soil [CO5] [PO5]

a) is directly proportional to the angle of internal friction of the soil

b) is inversely proportional to the angle of internal friction of the soil

c) decreases with increase in normal stress

d) decreases with decrease in normal stress

PART – B: (Short Answer Questions 10 X 2=20 Marks

Q.2. Answer *ALL* questions

a Distinguish between Residual soil and Transported soil with examples. [CO1] [PO1]

b Show the difference between liquidity index and flow index. [CO1] [PO1]

c Write the Darcy's law of permeability [CO2] [PO2]

d What do you mean by critical hydraulic gradient? [CO2] [PO2]

e Differentiate between Boussinesq's & Westergaard's method of analysis. [CO3] [PO3]

f	Find the vertical stress due to a point load of 20 kN acting at 3 m below the ground and at a radial distance of 2 m from the line of action of the load.	[CO3] [PO3]
g	Differentiate between consolidation and compaction.	[CO4] [PO4]
h	Write the assumptions made for the derivation of one dimensional Terzaghi's consolidation theory.	[CO4] [PO5]
i	What do you mean by Sensitivity and Thixotropy of clay?	[CO5] [PO5]
j	What is Taylor's Stability number?	[CO5] [PO5]

PART – C: (Long Answer Question 4 X 15=60 Marks

Answer *ALL* questions

Q.3

a	A soil sample has a porosity of 40 %. The specific gravity of soil solids is 2.70. Calculate a) Voids ratio, b) dry density, c) unit weight if the soil is 56% saturated and d) unit weight if the soil is completely saturated. Also establish the relation between bulk unit weight, specific gravity, void ratio and degree of saturation.	8+7 Marks	[CO1] [PO1]
b	Explain the soil classification of soil as per Indian Standards.		[CO1] [PO1]
	OR		
c	What do you mean by Atterberg Limits? A soil sample has a plastic limit of 25% and plasticity index of 30%. If the natural water content of the soil is 34%, what is the liquidity index and consistency index? How do you describe the consistency of this soil?	8+7 Marks	[CO1] [PO2]
d	Describe the types of clay minerals.		[CO1] [PO2]

Q.4

a	Explain the falling head permeameter test with neat sketch.		[CO2] [PO3]
b	A sand deposit is 10 m thick and overlies a bed of soft clay. The ground water table is 4 m below the ground surface. If the sand above the water table has a degree of saturation of 48%, plot the effective stress diagram, Take void ratio of sand as 0.7 and specific gravity as 2.65.	8+7 Marks	[CO2] [PO3]
	OR		
c	Explain the factors affecting the compaction.	7+8 Marks	[CO2] [PO4]
d	Explain the procedure to draw the flow nets for anisotropic soil.		[CO2] [PO4]

Q.5

a	Explain the equivalent methods to determine stress due to uniformly loaded area. Derive the for computing vertical stress at a point which is located at a depth (Z units) beneath the grou and below the center of a uniformly loaded circular area.	9+6 Marks	[CO3] [PO3]
b	Enumerate various methods to determine the coefficient of consolidation. Discuss any one method.		[CO4] [PO3]
	OR		
c	A certain clay layer has a thickness of 5 m. After one year, when the clay was 50% consolidat settlement had occurred. For similar clay and loading conditions, how much settlement wou the end of 1 year and 4 years respectively, if the thickness of this layer was 25 m?	8+7 Marks	[CO4] [PO4]
d	What do you mean by pressure bulb? A vertical concentrated load of 100 kN is applied on the ground surface. Plot the isobar for a stress intensity of 10 kN/m^2 due to this load, Use Boussinesq's equation.		[CO3] [PO5]

Q.6

a	A cohesion less soil sample failed in a triaxial test under a deviator stress of160 kN/m^2 when the cell pressure was 80 kN/m^2. If for the same sample, the confining pressure was increased to 160 kN/m^2, what would have been the deviator stress at failure?	8+7 Marks	[CO5] [PO5]
b	Explain the Vane shear test.		[CO5] [PO5]
	OR		
c	Explain the Friction circle method of analysis of slopes.		[CO5] [PO5]
d	What inclination is required where a filling 12 m high is to be constructed having a factor of safety 1.25? The soil has cohesion and angle of friction as 20 kN/m^2 and 15^0 respectively. The unit weight of soil is 17 kN/m^3. The stability number for Φ=12^0 is equal to 0.063 when slope is 30^0 and 0.098 for slope angle 45^0.	8+7 Marks	[CO5] [PO5]

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