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Reg. No

GIET UNIVERSITY, GUNUPUR – 765022
B. Tech (Third Semester – Regular) Examinations, December – 2020
BPCAG3040 - SOIL MECHANICS
(Agricultural Engineering)

Time: 2 hrs

Maximum: 50 Marks

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)   **(1 x 10 =10 Marks)**

Q.1. Answer *ALL* questions

a.   Water content of soil can
   (i)   Never be greater than 100%   (ii)   Takes values only from 0% to 100%
   (iii)   Be less than 0%   (iv)   Be greater than 100%

b.   A fully saturated soil is said to be
   (i)   One phase system   (ii)   two phase system with soil and air
   (iii)   two phase system with soil and water   (iv)   three phase system

c.   Valid range for degree of saturation, S of soil in percentage is
   (i) $S > 0$ (ii) $S \leq 0$
   (iii) $0 < S < 100$ (iv) $0 \leq S \leq 100$

d.   A soil mass has a bulk density of 22 kN/m^3 and water content 10%. The dry density of the soil is
   (i)   18.6 kN/m^3 (ii)   20 kN/m^3
   (iii)   22 kN/m^3 (iv)   23.2 kN/m^3

e.   If the voids of a soil mass are full of water only, the soil is termed as
   (i)   Air entrained soil   (ii)   Saturated soil
   (iii)   Dry soil   (iv)   Dehydrated soil

f.   If the volume of voids is equal to the volume of solids in a soil mass, then the values of porosity and void ratio respectively are
   (i)   1 and 0   (ii)   0 and 1
   (iii)   0.5 and 1   (iv)   1 and 0.5

g.   When the maximum moisture content at which a reduction in water content will not cause a decrease in volume of the soil, then the limit called as
   (i)   Elastic limit   (ii)   Plastic limit
   (iii)   Shrinkage limit   (iv)   Liquid limit

h.   The active earth pressure of a soil is proportional to
   (i) $\tan (45^o\text{-}\varphi)$ (ii) $\tan^2 (45^o\text{-}\varphi)$
   (iii) $\tan (45^o\text{+}\varphi)$ (iv) $\tan^2 (45^o\text{+}\varphi)$

i.   The passive earth pressure of a soil is proportional to
   (i) $\tan (45^o\text{-}\varphi)$ (ii) $\tan^2 (45^o\text{-}\varphi)$
   (iii) $\tan (45^o\text{+}\varphi)$ (iv) $\tan^2 (45^o\text{+}\varphi)$

j.   The lateral earth pressure on a retaining wall
   (i)   is equal to mass of the soil retained   (ii)   proportional to the depth of the soil
   (iii)   proportional to the square of the depth of the soil (iv)   proportional to the internal friction of the soil

PART – B: (Short Answer Questions)   **(2 x 5 = 10 Marks)**

Q.2. Answer *ALL* questions

a.   What is bulk unit weight? What are the methods to measure bulk unit weight?

b.   What are the Atterberg's limit? How to measure relative consistency?

c.   What is coefficient of consolidation?

d.   What is Coulomb's equation for shear strength of soil? Discuss the factors which affect the shear strength.

e.   How stability of slope determined?

PART – C: (Long Answer Questions)   **(6 x 5 = 30 Marks)**

Answer *ANY FIVE* questions   Marks

3.   Indicate how Boussinesq's equation can be used to determine the stress in the soil at a point due to   (6)
     uniformly distributed load at ground surface.

4.   What are the laboratory methods of finding shear strength of cohesive soils?   (6)

5.   Draw the pressure diagram for active earth pressure on a smooth retaining wall of height h with vertical   (6)
     backfill of cohesive soil with a cohesion c and friction φ.

6.   The plastic limit of a soil is 25% and its plasticity index is 8%. When the soil is dried from its state at   (6)
     plastic limit, the volume change is 25% of its volume at plastic limit. Similarly, the corresponding
     volume change from the liquid limit to the dry state is 34% of its volume at liquid limit. Determine the
     shrinkage limit and the shrinkage ratio.

7.   What is optimum moisture content? Describe the laboratory method for obtaining the optimum   (6)
     moisture content.

8.   A laboratory compaction test on soil having specific gravity equal to 2.68 gave a maximum dry density   (6)
     of 1.82 g/cm^3 and a water content of 17 percent. Determine the degree of saturation, air content and
     percentage air voids at the maximum dry density. What would be theoretical maximum dry density
     corresponding to zero air voids at the optimum water content?

9.   Derive the relation between void ratio (e), Specific gravity (G), water content (w) and degree of   (6)
     saturation of soil (S).

10. Test on a fill reveal that one cubic metre of soil in the fill weighs 1624 kg and after being dried, 1.40   (6)
     tonnes. If the specific gravity of solids is 2.65, determine the water content, void ratio, porosity and
     degree of saturation of the soil mass in moist state.

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