Reg. No. :

Question Paper Code: 1083381

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV/ DEC 2024
Third Semester
Agricultural Engineering
U20AG302 – SOIL SCIENCE AND ENGINEERING
(Regulation 2020)

Time: Three Hours   Maximum: 100 Marks

Answer ALL questions

PART – A   (10 x 2 = 20 Marks)

1.   Identify major components of soil.

2.   State the minerals which are present in soil.

3.   Describe base map.

4.   Define the basis of soil taxonomy.

5.   What are the Atterberg's limits? List its types.

6.   Discuss about plasticity and consistency.

7.   Delineate Cohesion.

8.   What is shear strength?

9.   List the three forces acting in circular failure while analyses through friction circle method?

10.   Explain critical depth.

<center>PART – B   (5 x 16 = 80 Marks)</center>

11. (a) State briefly about the physical properties of soil.   (16)

<center>(OR)</center>

(b) Elucidate the methods of determining the ion exchange property of soil.   (16)

12. (a) Give details about the methods of soil survey.   (16)

<center>(OR)</center>

(b) (i) Brief the preparation of survey report.   (8)
     (ii) Brief the uses of aerial photography in soil survey.   (8)

13. (a) In an earth dam under construction, the bulk unit weight is 16.5 kN/m³ at water content 11%. If the water content has to be increased to 15%, compute the quantity of water to be added per cu.m of soil. Assume no change in void ratio. Determine the degree of saturation at this water content. Take G = 2.7.   (16)

<center>(OR)</center>

(b) (i) Identify the factors affecting compaction in detail.   (8)
     (ii) The following index properties were determined for two soils A and 8

Index Properties	Soil A	Soil B
Liquid limit	65	35
Plastic Limit	25	20
Water content	35	25
Specific gravity	2.70	2.65
Degree of Saturation	100%	60%

Which of the two soils have i) contains more clay particles, ii) has a greater bulk density, iii) has a greater dry density, iv) greater voids ratio?   (8)

14. (a) A vane, 10cm long and 8cm in diameter, was pressed into soft clay at the bottom of a bore hole. Torque was applied and gradually increased to 45N-m when failure took place. Subsequently, the vane rotated rapidly so as to completely remold the soil. The remolded soil was shared a torque of 18N-m. Calculate the cohesion of the clay in the natural and remolded states and also find the value of sensitivity.   (16)

<center>(OR)</center>

(b) Analyze what are the factors that affect the permeability of soil.   (16)

15. (a) A footing of 2m square is laid at a depth of 1.3m below the ground surface. Take γ = 20kN/m³, ϕ'= 30°, c'=0. Determine the net ultimate bearing capacity when i) the water table rises to the level of the base, ii) the water table rises to the ground surface, iii) the water table is 1m below the base. (16)

(OR)

(b) (i) An embankment of 10m high is inclined at 35°to the horizontal. A stability analysis by method of slices gives the following forces: Total normal forces = 900 kN; total tangential force = 420 kN; total neutral force= 200kN. If the length of the failure arc is 23m, examine the FOS with respect to shear strength. The soil has C= 20 kN/m² and ϕ = 15°. (4)

(ii) A canal is to be excavated to a depth of 6m below ground level, through a soil having the following characteristics c = 15kN/m², ϕ = 20°, e=0.9 and G = 2.67. The slope of the bank is 1 in 1. Determine the FOS with respect to cohesion when the canal runs full. What will be the FOS if the canal is rapidly emptied completely? (12)

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