Code: 13A01702 **R13**

B.Tech IV Year I Semester (R13) Supplementary Examinations June 2018

GEOTECHNICAL ENGINEERING – II

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define 'Recovery ratio' of a soil sample.

(b) A soil sampler has an area ratio of 20% can you get an undisturbed sample using it. Give reason.

(c) Why method of slices is called "Swedish circle method"?

(d) Can we use Taylor's stability number for slopes in cohesion-less soils? Give reasons.

(e) If a retaining wall is not moving horizontally, what is the lateral pressure acting on it?

(f) In pure clay soil, up to what depth can we have a vertical cut without any lateral support.

(g) What is the assumed inclination of the boundaries of elastic zone in Terzaghi's bearing capacity theory?

(h) What equation do you use to calculate the minimum depth of a shallow foundation required?

(i) Define "Efficiency of a pile group".

(j) What is meant by 'optimum spacing' of piles in a pile group?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Explain with a neat sketch the procedure of conducting a plate load test.

(b) How do you plan and prepare a soil investigation report for a proposed 10 kilometre highway.

OR

3 (a) Explain wash boring with a neat sketch.

(b) What is a bore-log? Write a typical bore-log & explain how it is used in design of foundation.

UNIT – II

4 (a) What are the causes of failure of slopes?

(b) A soil slope is inclined at $i = 40°$ and has a height of 6 m. The soil properties are $C_u = 40\ kN/m^2$ $\gamma = 16\ kN/m^3$ & $\phi_u = 0$. Fellenius angles are $\alpha = 27°$, $\beta = 38°$. Use Swedish arc method & determine the factor of safety.

OR

5 (a) What is the basis of Taylor's stability number? Explain briefly.

(b) A canal is excavated to a depth of 4 m below GL. The soil has $C = 15\ kN/m^2$, $\phi = 15°$, $\rho = 0.8$, $G = 2.6$. The side slopes of canal are 1:1. Calculate the factor of safety w.r.t cohesion when the canal is full, if $S_n = 0.083$ and when it is suddenly & completely emptied using $S_n = 0.122$, calculate F_c.

UNIT – III

6 (a) Define / Explain the following: (i) Active earth pressure. (ii) Passive earth pressure. (iii) Earth pressure at rest.

(b) A retaining wall 6 m in height has vertical back & backfill surface is horizontal. The soil in backfill has $\gamma = 17.8\ kN/m^3$, $\phi = 32°$, $\delta = 23°$, $C = 0$. Use Rehbann's graphical method & determine the total active earth pressure on the wall, its inclination & position on the wall.

OR

7 (a) Explain with a neat sketch step-by-step procedure of Rehbann's graphical method to determine the total active earth pressure.

(b) A retaining wall 6.6 m in height has a smooth vertical back. The backfill has apparent cohesion of 24 kPa & $\phi = 0$. Calculate the earth pressure at top & bottom of the wall, depth of tension cracks and the total active earth pressure & its position.

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UNIT – IV

8 (a) In a plate load test, 300 mm square plate is used on a sandy soil. If S_p is the settlement of the plate. What would be the settlement S_F of a square footing of sides 1.5 m? If the soil is clay, what would be S_F.

(b) A square footing of sides 1.8 m is placed at 1.5 m depth below GL. The load from the column is 1000 kN. The soil is sandy up to 3 m depth with $\gamma = 16\ \mathrm{kN/m^3}$. Below this is a saturated clay 2 m thick with $\gamma_{sat} = 18.81\ \mathrm{kN/m^3}$, G = 2.7, W_L = 52%. Estimate the expected final consolidation settlement.

OR

9 (a) Explain the following with relevant formulae:

(i) Immediate elastic settlement.

(ii) Primary consolidation settlements.

(iii) Secondary compression settlement.

(b) Design a circular footing to support a column load of 1200 kN at a depth of 1.5 m below GL. The soil is purely cohesive soil with $\phi_u = 0,\ C_u = 70\ \mathrm{kPa},\ \gamma = 16\ \mathrm{kN/m^3}$. Use F.O.S = 3.

UNIT – V

10 (a) Explain with a neat sketch the procedure to conduct a static pile load test on a working pile.

(b) Calculate the safe load carrying capacity of a square pile of sides 400 mm & length 8 m in a soil which has $C = 60\ \mathrm{kPa},\ \phi = 20°,\ \gamma = 15\ \mathrm{kN/m^3}$, use $N_c = 9,\ N_q = 10\ \&\ N_r = 34$. Assume $\alpha = 0.8$, FOS = 2.5.

OR

11 (a) Draw a neat sketch of an under-reamed pile with two bulbs showing standard dimensions & explain.

(b) A six piles group is driven into a sandy soil up to 7 m depth. The piles are 300 mm in diameter at 750 mm c/c spacing. The soil properties are $C = 0,\ \phi = 30°,\ \delta = 20°,\ \gamma = 18\ kN/m^3,\ K = 1.2$ use $N_q = 18$, $N_r = 37$, FOS = 3 for end bearing & FOS = 2 for skin friction & calculate the safe load on the pile group.

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