

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Fifth semester B.Tech degree examinations (S) September 2020

**Course Code: CE305****Course Name: GEOTECHNICAL ENGINEERING - II**

Max. Marks: 100

Duration: 3 Hours

***Graph sheets may be provided*****PART A*****Answer any two full questions, each carries 15 marks.***

Marks

- 1 a) Determine the vertical stresses in soil at a depth of 6 m below column foundations vertically below column A and column B. Columns A and B are 5.5 m apart. Concentrated load on column A is 400 kN and on Q is 300 kN. (7)
- b) Explain the use of Newmark's chart. (4)
- c) A 5m high retaining wall supports a clayey backfill with bulk density  $18 \text{ kN/m}^3$  cohesion  $c = 30 \text{ kN/m}^3$  and  $\phi = 30^\circ$ . Determine the earth pressure developed per metre length of the wall when wall is pushed towards the backfill and also the point of application. (4)
- 2 a) A 6m high retaining wall with smooth vertical back supports a two layered stratum .Calculate the magnitude of active pressure per metre length of wall for the following data (7)
- I layer :  $H_1 = 4\text{m}$ ,  $c=0$ ,  $\phi = 35^\circ$ ,  $\gamma = 18 \text{ kN/m}^3$
- II layer :  $H_2 = 2\text{m}$ ,  $c=0$ ,  $\phi = 30^\circ$ ,  $\gamma = 19 \text{ kN/m}^3$
- b) What is an Isobar? What are the uses of an Isobar? (4)
- c) What are the assumptions of Boussinesq's theory? (4)
- 3 a) A rectangular foundation  $3\text{m} \times 2\text{m}$  carries a uniform load intensity of  $50 \text{ kN/m}^2$ . Determine the vertical stress at the centre of the plan of the foundation at 5m below ground level by equivalent point load method by dividing the area into 4 equal parts. (7)
- b) Explain Active and Passive earth pressure with examples. (4)
- c) List the assumptions of Rankine's theory of lateral earth pressure. (4)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) A square footing 2 m wide is founded at a depth of 1.4 m in sand. Soil properties are  $c=0$ ,  $\phi= 35^\circ$ ,  $\gamma_{\text{sat}} = 19 \text{ kN/m}^3$  and unit weight above water table =  $17.5 \text{ kN/m}^3$ . Bearing capacity factors are  $N_q= 41.4$  and  $N_\gamma = 42.4$ . Determine Ultimate bearing capacity if water table is at i) 3.5 m below ground level ii) 1.4 m below ground level (7)
- b) What are the assumptions of Terzaghi's bearing capacity theory? (4)
- c) Explain any four methods adopted to rectify tilts and shifts in well foundation (4)
- 5 a) Design a combined trapezoidal footing for two columns of sizes 0.5 m x 0.5 m and 0.3 m x 0.3 m carrying loads 3000 kN and 2000 kN respectively. Centre to centre distance of columns = 5 m. Footings shall not project beyond the outer surface of columns. Allowable soil pressure is  $250 \text{ kN/m}^2$ . (7)
- b) Explain the types of failure mechanisms in shallow foundations (4)
- c) Explain the Preloading method of soil improvement (4)
- 6 a) Explain the components of a well foundation with a neat sketch (7)
- b) Determine the net allowable load for a circular footing of 2.5 m diameter founded at a depth of 1.2m. Soil properties are  $c = 80 \text{ kN/m}^2$ , Take factor of safety as 3. (4)
- c) What is a floating raft foundation? (4)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Explain Standard Penetration test and its correlations with shear strength parameters. What are the corrections to be applied for SPT value? (10)
- b) A RCC pile weighs 50 kN. It is driven by a single acting steam hammer weighing 40 kN, height of fall is 1 m. Average set/blow is 1.0 cm. Take elastic compression as 1.8 cm. Assuming coefficient of restitution as 0.5. Find safe load on pile. Assume factor of safety of 2.5. (6)
- c) What are the objectives of a Subsoil exploration programme? (4)

- 8 a) A pile load test is done on a 30 cm diameter pile. Determine the safe load (10) considering settlement and shear failure criteria. Take factor of safety as 2.5 for shear failure criteria.

<b>Load (kN)</b>	0	200	400	600	800	1000	1200
<b>Settlement (mm)</b>	0	1.5	4.0	7.75	14.0	24.0	37.0

- b) What are the IS guidelines for choosing depth and spacing of Bore holes? (6)
- c) What is Negative skin friction? What are the causes for negative skin friction? (4)
- 9 a) Determine safe load for a concrete pile 30 cm diameter driven into dense sand for (10) a depth of 7 m. The soil properties are  $\phi = 35^\circ$ ,  $\gamma = 19 \text{ kN/m}^3$ ,  $K = 2$ ,  $N_q = 60$ ,  $N_\gamma = 42.4$ . Take critical depth for overburden pressure as 15 and factor of safety as 2.5.
- b) Explain Wash boring method of subsoil exploration. (6)
- c) Determine the natural frequency of a machine foundation having a base area of (4)  $2.5 \times 2.5 \text{ m}$  and a mass of 10000 Kg, including mass of the machine. Take Coefficient of uniform elastic compression as  $10^7 \text{ N/m}^3$ .

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