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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 kN/m^3 cohesion c = 30 kN/m^3 and ϕ= 30°.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= 4m, c=0, ϕ= 35°,γ = 18 kN/m^3

   II layer : H_2= 2m, c=0, ϕ= 30°,γ = 19 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 3m x 2 m carries a uniform load intensity of 50 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 (7)
are c=0, ϕ= 35°, γ_{sat} = 19 kN/m^3 and unit weight above water table = 17.5
kN/m^3.Bearing capacity factors are Nq= 41.4 and Nγ = 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

   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 (7)
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 kN/m^2.

   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 (4)
founded at a depth of 1.2m. Soil properties are c = 80 kN/m^2, Take factor of
safety as 3.

   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 (10)
parameters. What are the corrections to be applied for SPT value?

   b) A RCC pile weighs 50 kN. It is driven by a single acting steam hammer (6)
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.

   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.

Load (kN)	0	200	400	600	800	1000	1200
Settlement (mm)	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 $\phi = 35°$, $\gamma = 19$ kN/m³, K =2 , Nq= 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)
2.5x2.5 m and a mass of 10000 Kg, including mass of the machine. Take
Coefficient of uniform elastic compression as 10^7 N/m³.

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