Model Question Paper (CBCS Scheme)

Fifth Semester B.E. Degree Examination (CIVIL)
Applied Geotechnical Engineering (15CV53)

Time: 3 Hours   **Max. Marks: 80**

Note: Answer FIVE full questions, choosing one full question from each Module.

<u>Module -1</u>

1.
 a. List and explain various types of samplers (6 Marks)
 b. Explain seismic refraction method of soil exploration with neat sketch (6 Marks)
 c. A sampling tube has inner diameter of 70mm and cutting edge of 68mm. its outside diameters are 72 mm and 74mm respectively. Determine area ratio, inside clearance, outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 580mm with length of sample recorded being 520mm. find the recovery ratio. (4 Marks)

<div align="center">OR</div>

2.
 a. What are the objectives of subsurface exploration? (4 Marks)
 b. List out the methods of dewatering. Explain any two method of dewatering with neat sketch (6 Marks)
 c. Estimate the ground water level by Hvorslev's method using the data given. Depth up to which water is bailed out is 30m, rise in water level after first day is 2.2m, second day 1.8m and on third day it is 1.5m. (6 Marks)

<u>Module -2</u>

3.
 a. Explain a 2V:1H approximate method to determine stress at a depth Z below the footing of rectangular shape of size B x L. (4 Marks)
 b. List the components of settlement. Give expressions to calculate each one of them, clearly specifying what the notations stand for. (6 Marks)
 c. A structure is supported by ring foundation of outer inner diameters 8m and 5m respectively. If the foundation transmits contact pressure of 200kN/m2, compute the stress 3m below the center of the foundation. (6 Marks)

<div align="center">OR</div>

4.
 a. A footing of rectangular shape 6m x 8m is uniformly loaded with $180kN/m^2$ at the ground level. Newmark's chart of influence factor 0.004 is used to find the stress at a certain depth. It that found that 24 elements of the chart are covered by the loaded area. Determine the stress. (4 Marks)
 b. Explain with sketches various types of settlements. Comment on the sustainability of these types of settlements and functional utility of the structure. (4 Marks)
 c. A soft clay layer is 5m thick and lies under newly constructed building. The effective pressure due to overlying strata is $300kN/m^2$ and new construction increased the overburden by $120kN/m^2$. If liquid limit is 80%, natural water content of the clay layer is 43% and G=2.70. Dry density of the clay is $18kN/m^3$. Compute the settlement. (8 Marks)

Module -3

5.
a. Explain what is meant by active and passive states of plastic equilibrium with sketch. (4 Marks)
b. An embankment is made of soil having $C=25kN/m^2$ and $\varphi=20^0$ and unit weight $\gamma=19kN/m^3$. The slope is 1.5H: 1V and has 9m height. Determine the factor of safety along a slip circle passing through toe. The center of slip circle is located at Fellinious angles $\alpha=26^0$ and $\beta=35^0$. Use method of slices and analyze. (12 Marks)

OR

6.
a. Derive an expression for factor of safety for infinite slope (6 Marks)
b. A retaining wall is 9.0m high , retains cohesion-less backfill. The top 3m of fill has unit weight $\gamma=18kN/m^3$ with $\varphi= 32^0$. The rest has unit weight $\gamma=22kN/m^3$ with $\varphi= 22^0$. Determine the active earth pressure on the wall and its position. (10 Marks)

Module -4

7.
a. Define
   i. Safe bearing capacity
   ii. Allowable bearing capacity (4 Marks)
b. What will be the net safe bearing pressure of sand having $\varphi =36^0$, take effective unit weight of soil as $19kN/m^3$
   i. 1.2m wide strip footing
   ii. 1.2m wide square footing. (6 Marks)
c. Write a note on how bearing capacity changes with respect to water table level. (6 Marks)

OR

8.
a. When there is need of combined footing, explain with sketches (6 Marks)
b. Design a square footing to carry a safe load of 2400kN on a sandy soil at a depth of 1.5m below GL with factor of safety of 3. Given $\gamma_{sat}=21kN/m^3$ with $N_c = 25$, $N_q = 34$ and $N_\gamma = 32$. Permissible settlement is 40mm. water table may rise up to the base of the footing. (10 Marks)

Module -5

9.
a. Write a note on classification of piles (6 Marks)
b. What is meant by efficiency of pile group, explain Feld's rule. (4 Marks)
c. A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile. (6 Marks)

OR

10.
a. Explain static formula for the design of piles (6 Marks)
b. Draw atypical arrangement of under reamed pile with proportion of diameter of pile, bulb and spacing (6 Marks)
c. Write a note on pile load test (4 Marks)