Department of Civil Engineering
CEL 423: Major Examination   50% Credit   Two Hours

1. **State true or false:**   30 Points

   (a) Load test on the pile is one of the best methods of determining the load carrying capacity of a pile.

   (b) Pile driving in sensitive clays could result in the reduction of resistance due to remoulding

   (c) The bearing capacity of a purely cohesive soil is independent of the width of the foundation

   (d) Brinch Hansen's theory of bearing capacity gives better results for cohesive soils than for cohesionless soils when compared with Terzaghi's theory

   (e) The standard penetration test is commonly used for cohesionless soils.

   (f) Generally speaking, the effect of pore water is to reduce the stability of a slope.

   (g) Unit adhesion can not exceed unit cohesion of the soil

   (h) Fluctuations in water table at very great depth (at depths more than the width of the footing) does not affect the bearing capacity of the footing.

   (i) Analysis of slope stability is a statically indeterminate problem

   (j) Displacement piles are usually bored cast in situ piles

   (k) Estimation of load carrying capacity of a laterally loaded pile is very easy as compared to vertically loaded pile.

   (l) Negative skin friction increases the load carrying capacity of a pile.

   (m) There is no rational method to determine the mass of soil participating in the vibration of a machine foundation soil system.

   (n) It is possible to change the natural frequency of the foundation system at a later stage after construction, if necessary.

   (o) Design of a machine foundation is an iterative procedure

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2. List five remedial measures against harmful settlements.　　　　5

3. List the types of piles based on method of installation.　　　　5

4. What is meant by "tuning" of a machine foundation.　　　　5

5. Briefly explain the difference between "material damping" and "radiation damping"　　　　5

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6. A cantilevered sheet pile wall is to support a the side of an excavation 3 m deep. Determine the safe driving depth required. $c' = 0$; $\Phi = 30°$; $\gamma = 20$ kN/m³. 20

7. A square footing is to be constructed at a depth of 4 m below the ground surface on a sandy clay soil for which the cohesion is 50 kN/m² and the bulk density is 16.8 kN/m³. The total load applied to the soil is 4250 kN and is uniformly distributed. Find out the size of the footing using Terzaghi's formula. Use a factor of safety of 3. $N_c = 10$, $N_q = 4$ and $N_\gamma = 2$ 15

8. A vertical wall 10 m high supports a horizontal backfill of sand of unit weight 17 kN/m³. The active pressure at the base of the wall 50 kN/m². Later a uniform surcharge of 20 kN/m² is place over the fill. Estimate the maximum earth pressure and the resultant force on the wall after the surcharge is placed. 5

9. The coefficient of elastic uniform compression of a soil is found to be 20,000 $kN/m³$ using a block having a base area of 4 $m²$. What will be the percentage variation in its value, if the base area of the block is halved? 10