**Course Code:** 18CE0133 **R18**

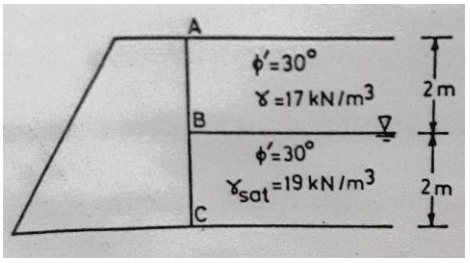
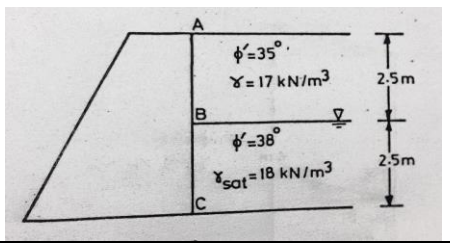
**SIDDHARTH GROUP OF INSTITUTIONS:: PUTTUR**
**(AUTONOMOUS)**
Siddharth Nagar, Narayanavanam Road – 517583

**QUESTION BANK (DESCRIPTIVE)**

**Subject with Code:** Foundation Engineering (18CE0133) **Course & Branch**: B.Tech - CE

**Year & Sem:** III-B.Tech & II-Sem **Regulation:** R18

## UNIT –I
## EARTH PRESSURE THEORIES & RETAINING WALLS

| | | | | |
|---|---|---|---|---|
| **1** | **a** | Write short notes on plastic equilibrium in soils. | [L1][CO1] | **[2M]** |
| | **b** | Write short notes on variation of pressure with neat sketch. | [L1][CO1] | **[2M]** |
| | **c** | List out various assumptions of coulomb's wedge theory. | [L1][CO1] | **[2M]** |
| | **d** | Write short notes on Rehbann's construction for active pressure. | [L1][CO1] | **[2M]** |
| | **e** | Write short notes on Retaining walls. | [L1][CO2] | **[2M]** |
| **2** | Define earth pressure theory and various types of lateral earth pressure with neat sketch. | | [L2][CO1] | **[10M]** |
| **3** | Determine the lateral earth pressure at rest per unit length of wall as shown in fig. Also determine the resultant earth pressure. Take $K_0=1-\sin\varphi'$, $\gamma_w=10kN/m^3$.   | | [L3][CO1] | **[10M]** |
| **4** | What are the assumptions of earth pressure theory and derive an expression for Rankines Earth pressure in cohesive soils. | | [L2][CO1] | **[10M]** |
| **5** | Derive expression for coulomb's wedge theory for active pressure with neat sketch. | | [L3][CO1] | **[10M]** |
| **6** | Discuss culmann's method for the determination of active earth pressure. | | [L3][CO1] | **[10M]** |
| **7** | Determine the active pressure on the retaining wall as shown in fig. Take $\gamma_w=10kN/m^3$.   | | [L3][CO1] | **[10M]** |
| **8** | Explain various types of retaining walls with neat sketch. | | [L2][CO2] | **[10M]** |
| **9** | With the help of neat sketch explain design of gravity retaining walls. | | [L2][CO2] | **[10M]** |
| **10** | Explain various requirements of stability analysis of Gravity retaining walls. | | [L2][CO2] | **[10M]** |

| | | | |
|---|---|---|---|
| **11** | A cantilever retaining wall of 7mts height retains sand. The properties of sand are e=0.5,φ=$30^0$ and G=2.7m.Using Rankines theory Determine the active earth pressure at the base when the backfill is (i) dry (ii) saturated (iii)submerged and also the resultant active force in each case. | [L3][CO1] | **[10M]** |

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# UNIT –II
## SHALLOW FOUNDATIONS & SETTLEMENTS

| | | | | |
|---|---|---|---|---|
| **1** | **a** | Define Net ultimate bearing capacity | [L1][CO3] | **[2M]** |
| | **b** | Write short notes on limitations of plate load test. | [L1][CO3] | **[2M]** |
| | **c** | Define Safe bearing capacity | [L1][CO3] | **[2M]** |
| | **d** | Write short notes on Tolerable settlement. | [L1][CO3] | **[2M]** |
| | **e** | Define Net allowable bearing pressure | [L1][CO3] | **[2M]** |
| **2** | What are different types of shallow foundations? Explain with the help of neat sketches. | | [L2][CO3] | **[10M]** |
| **3** | (a) With neat sketches explain different types of shear failures.<br>(b) Determine the ultimate bearing capacity of a strip footing, 1.20 m wide, and having the depth of foundation of 1.0 m. use Terzaghi's theory and assume general shear failure. Take $\varphi = 35^o$, $\gamma = 18$ kN/m$^3$, and C' = 15 kN/m$^2$. Take ($N_c$=57.8, $N_\gamma$=42.4, Nq=41.4) | | [L2][CO3]<br>[L3][CO3] | **[5M]**<br>**[5M]** |
| **4** | Discuss effect of water table on the bearing capacity of the soil with neat sketch? | | [L2][CO3] | **[10M]** |
| **5** | a) List out various parameters for choice of type of foundation.<br>b) Write various points to consider for fixing depth of foundation. | | [L1][CO3]<br>[L1][CO3] | **[5M]**<br>**[5M]** |
| **6** | A strip footing of 2m width is founded at a depth of 4m below the ground surface. Determine the net ultimate bearing capacity, using a) Terzaghi's equation ($N_C$=5.7, $N_\gamma$=1.0, Nq=0.0) b) Skempton's equation c) IS Code ($N_C$=5.14). The soil is clay ($\varphi=0^0$, C-10kN/m$^2$).The unit weight of soil is 20kN/m$^2$. | | [L3][CO3] | **[10M]** |
| **7** | Describe how the plate load test is conducted with a neat sketch? | | [L2][CO3] | **[10M]** |
| **8** | What are different types of settlements that occur in a foundation? | | [L2][CO3] | **[10M]** |
| **9** | Discuss the various methods of determination of allowable soil pressure in cohesion less soils? | | [L2][CO3] | **[10M]** |
| **10** | Discuss the various methods of determination of allowable soil pressure in cohesion soils? | | [L2][CO3] | **[10M]** |
| **11** | (a) Determine the ultimate bearing capacity of a square footing, resting on the surface of saturated clay of unconfined compressive strength of 98kN/m$^2$.<br>(b)A rectangular footing (3 m X 2 m) exerts a pressure of 100 kN/m$^2$ on a cohesive soil ($E_s$ =5x10$^4$ and $\mu$=0.50).Determine the immediate settlement at the centre, assuming a) Footing is flexible b) Footing is rigid. | | [L3][CO3]<br>[L3][CO3] | **[5M]**<br>**[5M]** |

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## UNIT –III
## PILE FOUNDATIONS

| | | | | |
|---|---|---|---|---|
| **1** | **a** | Write short notes on piles. | [L1][CO4] | **[2M]** |
| | **b** | Define negative skin friction. | [L1][CO4] | **[2M]** |
| | **c** | Write short notes on (a) Displacement piles (b) Non Displacement piles | [L1][CO4] | **[2M]** |
| | **d** | What are under reamed piles? | [L1][CO4] | **[2M]** |
| | **e** | Define allowable load. | [L1][CO4] | **[2M]** |
| **2** | | Define pile foundation? Detail about necessity of pile foundation? | [L1][CO4] | **[10M]** |
| **3** | | List out various classifications of pile foundations. Discuss different methods for installation of piles | [L2][CO4] | **[10M]** |
| **4** | | How would you estimate the load carrying capacity of a pile in (a) cohesion less soils (b) cohesive soils by using static methods? | [L2][CO4] | **[10M]** |
| **5** | | How would you estimate the load carrying capacity of a pile by using dynamic formulae? | [L2][CO4] | **[10M]** |
| **6** | | Explain in detail In-situ penetration tests for pile capacity. | [L1][CO4] | **[10M]** |
| **7** | | a) A 30cm diameter concrete pile is driven into a homogeneous consolidated clay deposit ($c_u$=40kN/m$^2$, $\alpha$=0.7).If the embedded length is 10m, estimate the safe load (F.S. =2.5).<br>b) A square concrete pile (30cm side) 10 m long is driven into coarse sand ($\gamma$=18.5 kN/m$^3$, N=2.0). Determine the allowable load (F.S. =3.0). | [L3][CO4]<br>[L2][CO4] | **[5M]**<br>**[5M]** |
| **8** | | How would you estimate the group action of piles in (a) sand (b) clay? | [L2][CO4] | **[10M]** |
| **9** | | Describe how the pile load test is conducted with a neat sketch? | [L2][CO4] | **[10M]** |
| **10** | | Explain settlement of pile groups in (a) cohesion less soils (b) cohesive soils. | [L2][CO4] | **[10M]** |
| **11** | | A precast concrete pile (35cm x 35cm) is driven by a single –acting steam hammer. Estimate the allowable load using (a) Engineering News Record Formula (F.S.=6) (b)Hiley Formula (F.S.=4) and (c) Danish Formula (F.S. =4).<br>Use the following data.<br>(i) Maximum rated Energy = 3500kN-m<br>(ii) Weight of hammer = 35kN<br>(iii) Length of pile = 15m<br>(iv) Efficiency of hammer = 0.8<br>(v) Coefficient of resistitution = 0.5<br>(vi) Weight of pile cap = 3kN<br>(vii) No of blows for last 2.54mm = 6<br>(viii) Modulus of elasticity of concrete = 2 x $10^7$ kN/m$^2$<br>(ix) Assume any other data, if required. Take the weight of pile as 73.5kN. | [L3][CO4] | **[10M]** |

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# UNIT –IV

## WELL FOUNDATIONS & CAISSON FOUNDATION

| | | | | |
|---|---|---|---|---|
| **1** | **a** | Write short notes on Well foundation. | [L1][CO5] | **[2M]** |
| | **b** | Write short notes on Grip Length. | [L1][CO5] | **[2M]** |
| | **c** | List out various components of Well foundations. | [L1][CO5] | **[2M]** |
| | **d** | Write short notes on caisson foundation. | [L1][CO5] | **[2M]** |
| | **e** | List out various types of Caisson. | [L1][CO5] | **[2M]** |
| **2** | | Explain different shapes of wells with neat sketch. | [L1][CO5] | **[10M]** |
| **3** | | Discuss various forces acting on well foundation. | [L1][CO5] | **[10M]** |
| **4** | | What are the various components of well foundations? What are its uses? | [L1][CO5] | **[10M]** |
| **5** | | Explain various steps involved in sinking operation of wells with neat sketch. | [L2][CO5] | **[10M]** |
| **6** | | Explain various measures for rectification of Tilts and Shifts with neat sketch. | [L2][CO5] | **[10M]** |
| **7** | | Explain the construction of open caisson with the help of neat sketch. | [L2][CO5] | **[10M]** |
| **8** | | Describe the various components of pneumatic caisson with the help of neat sketch. | [L2][CO5] | **[10M]** |
| **9** | | Explain the construction of Floating caisson with the help of neat sketch. | [L2][CO5] | **[10M]** |
| **10** | | What are the advantages and disadvantages of pneumatic caisson over open caisson? | [L1][CO5] | **[10M]** |
| **11** | | What are the advantages and disadvantages of Floating caisson and discuss stability of floating caisson during flotation? | [L1][CO5] | **[10M]** |

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# UNIT –V
## MACHINE FOUNDATIONS

| | | | | |
|---|---|---|---|---|
| **1** | **a** | Write short notes on Machine foundations. | [L1][CO6] | **[2M]** |
| | **b** | Define (i)Free vibration (ii) Forced vibration | [L1][CO6] | **[2M]** |
| | **c** | Write short notes on Frequency. | [L1][CO6] | **[2M]** |
| | **d** | Write short notes weight of foundation. | [L1][CO6] | **[2M]** |
| | **e** | Write short notes on Degree of freedom. | [L1][CO6] | **[2M]** |
| **2** | Define Machine Foundation and types of machine foundations with neat sketch and list its suitability. | | [L1][CO6] | **[10M]** |
| **3** | Explain general criteria for design of machine foundations. | | [L2][CO6] | **[10M]** |
| **4** | Explain design criteria of foundation in case of free undamped vibrations. | | [L3][CO6] | **[10M]** |
| **5** | Explain in detail vibration analysis of machine foundation and determine mass (m) parameter. | | [L2][CO6] | **[10M]** |
| **6** | Derive various methods used to determine spring stiffness(k) parameter in vibration analysis of machine foundation | | [L2][CO6] | **[10M]** |
| **7** | Explain in detail the determination of natural frequency by using theory of vibrations. | | [L2][CO6] | **[10M]** |
| **8** | a) The exciting force of a machine is 100kN.Determine the transmitted force if the natural frequency of the machine foundation is 3.0Hz.Take D=0.40 and the operating frequency as 5Hz.<br>b) A 2.50Mg vertical compressor foundation system is operated at 40Hz.The soil at the site is medium stiff clay ($C_u$=4 x $10^4$ kN/$m^3$).Determine the natural frequency and the magnification factor, assuming $m_s$=0.2mf.The base area is 2.5$m^2$.Take D=0. | | [L3][CO6]<br>[L3][CO6] | **[5M]**<br>**[5M]** |
| **9** | a) Determine the natural frequency of a machine foundation having a base area 2m x 2m and a mass of 15Mg, including the mass of the machine. Taking $C_u$=4 x$10^4$ kN/$m^2$.<br>b) The natural frequency of a machine foundation is 4 hertz. Determine its magnification at the operating frequency of 8 hertz. Take damping factor (D) as 0.30. | | [L3][CO6]<br>[L3][CO6] | **[5M]**<br>**[5M]** |
| **10** | A foundation block of weight 30kN rests on a soil for which the stiffness may be assumed as 25000kN/m. The machine is vibrated vertically by an exciting force of 3.0 sin (30t) kN. Find the natural frequency, natural period, natural circular frequency and the amplitude of vertical displacement. The damping factor is 0.50. | | [L3][CO6] | **[10M]** |
| **11** | a) Explain reinforcement and construction details of machine foundations.<br>b) List out various measures adopted for vibration isolation and control. | | [L2][CO6]<br>[L1][CO6] | **[5M]**<br>**[5M]** |

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