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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

MAKE-UP EXAMINATION - JULY 2024

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| **Semester : V** | **Date :** **02 JULY 2024** |
| **Course Code : CIV3027\_v02** | **Time :9.30 AM to 12.30 PM** |
| **Course Name :** **Foundation Engineering** | **Max Marks :100** |
| **Program:** **B.Tech. Civil** | **Weightage :50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

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| **PART A** | | | |
| **ANSWER ANY 4 QUESTIONS 4Q X 5M=20M** | | | |
| 1 | There are various factors that cause instability in a slope and lead to failure. List the causes of failure of slope. | (CO 1) | [Knowledge] |
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| 2 | Boussinesq and Westergaard gave the theoretical solutions for the stress distribution in an elastic medium subjected to a concentrated load on its surface. List the difference between Boussinesq and Westergaard theories. | (CO 1) | [Knowledge] |
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| 3 | Determine the factor of safety with respect to cohesion for a submerged embankment 25 m high and having a slope of 40 degree. Cohesion is 40 kN/m2, φ is 10 degree and saturated unit is 18 kN/m3. Taylor’s stability number Sn is 0.097. | (CO 1) | [Knowledge] |
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| 4 | Explain active and passive earth pressure with a neat sketch. | (CO 2) | [Knowledge] |
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| 5 | Tezaghi’s analysis were made to analyze the bearing capacity failure. Various assumptions were made to determine the ultimate bearing capacity of the soil. List the assumptions made in the Terzghi’s analysis. | (CO 3) | [Knowledge] |
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| 6 | If the soft soil surrounds pile then negative skin friction occurs. Explain negative skin friction and explain with a neat drawing. | (CO 4) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 4 QUESTIONS 4Q X 10M=40M** | | | |
| 7 | There are different factors of safety which are used in the analysis of slope stability. List the various factors of safety with formulas to compute them. The shear strength parameters of soil are C’= 26.7 kPa, φ’=150, C’m= 17.8 kPa, φ’m=120, Calculate the factor of safety a) with respect to strength b) with respect to cohesion, c) with respect to friction. The average inter granular pressure σ’=102.5 kPa. | (CO 1) | [Comprehension] |
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| 8 | Isobars are the contours joining the points of same stress. A concentrated load of 50 kN acts on the surface of the soil. Determine the vertical stress variation at points directly beneath the load up to a depth of 10 m and draw a plot. Also plot the variation of vertical stress due to load on horizontal planes at depths of 1m and 3m up to a horizontal distance of 3 m on either side of center. Use Boussinesq’s theory for point loads. | (CO 1) | [Comprehension] |
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| 9 | Determine the stresses of the vertical cut shown in figure. Also determine the maximum depth of potential crack and maximum depth of unsupported excavation. | (CO 2) | [Comprehension] |
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| 10 | A square footing 2.5 m by 2.5 m is built in a homogeneous bed of sand of unit weight 20 KN/m3 and having an angle of shearing resistance of 36 degrees. The depth of base of footing is 1.5 m below the ground surface. Calculate the safe load that can be carried by a footing with a factor of safety of 3 against complete shear failure. Take Nc=65.4, Nq= 49 .4 and Nγ=54. | (CO 3) | [Comprehension] |
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| 11 | Investigations were made at three sites of office buildings to determine the type of bearing capacity failure. The bearing capacity of the soil was not adequate. The analysis were carried out to find that the failure is due to general shear failure, punching shear failure and local shear failure. Explain these failures with a neat sketch. | (CO 3) | [Comprehension] |
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| 12 | Pile foundations are the deep foundations. List any four classification of pile foundation. | (CO 4) | [Comprehension] |
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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** | | | |
| 13 | A 5 meter deep canal has side slopes of 1:1. The properties of soil are c=20kN/m2, φ=10̊, e=0.8 and G=2.8. If Taylor’s stability number is 0.108, determine the factor of safety with respect to cohesion, when canal runs full. Also determine the factor of safety with respect to cohesion, for sudden drawdown condition with Taylor’s stability number 0.137. | (CO 1) | [Application] |
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| 14 | A 5 m high retaining wall is shown in Figure. Determine the Rankine’s active earth pressure on the wall. a) Before the formation of tension crack and b) after the formation of tension crack. | (CO 2) | [Application] |
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| 15 | A strip footing 3 m wide carries a load intensity of 400 kPa at a depth of 1.2 m in sand. The saturated unit weight of sand is 19.5 kN/m3 and unit weight above water table is 16.8 kN/m3. The shear strength parameters are c=0 and φ=350. Determine the factor of safety for the following cases of water table a) Water table is 4 m below GL (ground line), b) Water table is 1.2 m below GL, c) Water table is 2.5 m below GL, d) Water table is 0.5 m below GL and e) Water table is at ground level itself. Assume Nq=41.4 and Nγ=42.4. | (CO 3) | [Application] |
| 16 | A. pile group consists of 9 friction piles of 30 cm diameter and 10 m length driven in clay as shown in Fig. (Cu= 100 kN/m2 and γ=20kN/m3. Determine the safe load for the group. FS=3 and α=0.6 (adhesion factor) as shown in Fig. Determine the safe load for the group. | (CO 4) | [Application] |
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