

**Scheme of Valuation/Answer Key (D1069)**

(Scheme of evaluation (marks in brackets) and answers of problems/key)

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019

**Course Code: CE208**

**Course Name: GEOTECHNICAL ENGINEERING I (CE)**

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| **Max. Marks: 100** | | |  | **Duration: 3 Hours** | |
|  |  |  |  | **PART A** |  |
|  |  | **Answer any two full questions, each carries 15 marks** | | | Marks |
|  |  |  | | |  |
| 1 | a) | Equation of void ratio -- *2marks* | | | 6 |
|  |  | Calculation steps – 2marks | | Ans. % reduction in volume≈13.95%- *2marks* |  |
|  |  |  | | |  |
|  | b) | Equations related to bulk density, water content, G, degree of saturation & void ratio --*3 marks* | | | 9 |
|  |  |
|  | Calculation steps –2marks | | |  |
|  | Ans.:e ≈0.65 , Sr≈42.4% --*2marks* | | |  |
|  | weight of water to be added for complete saturation ≈222.3kN ---*2marks* | | |  |
|  |  | | |  |
| 2 | a) | Equations related to problem – *2marks* | | | 6 |
|  |  | Calculation steps –*2marks*Ans.: G ≈2.8 --*2marks* | | |  |
|  | b) | Proper sketch of plasticity chart – *4marks* | | | 9 |
|  |  | Marking of all details(X,Y axes, different zone, soil notations, A-line.) – *3marks* | | |  |
|  |  | Practical application --*2marks* | | |  |
|  |  |  | | |  |
| 3 | a) | Definition of Bulk unit weight, air content ,water content and %air voids- 2 marks  Steps- 4 marks | | | 8 |
|  |  |  |
|  |  |  | Answer , γ=naγw(1-ac)(1+w)/wac*2marks* | |  |
|  |  |  | | |  |
|  | b) | Need of deflocculating agent correction – *3marks;* nature of correction– *1mark* | | | 7 |
|  | Mention details of a commonly used deflocculating agent– *3marks* | | |  |
|  |  |  |  |  |
| **PART B** | | | | | |
| **Answer any two full questions, each carries 15 marks** | | | | | |
| 4 | a) | Differentiate between critical hydraulic gradient and exit gradient --*6marks* | | | 6 |
|  |  | | |  |
|  | b) | Saturated density of soil =18.82kN/m3--*1marks*  steps – *2marks* | | | 9 |
|  | Ans.:(total, neutral and effective stress at 1.2m) --*3marks*  σ =22.59kPa u=(-)2.943kPa σ’=25.53kPa  Ans.:(total, neutral and effective stress at 4.2m) --*3marks*  σ=79.06kPa u=-26.48kPa σ’=52.58kPa | | |  |
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| 5 | a) | Steps –analytical or Plotting in the graph for Graphical method -6 marks | | 15 |
|  |  | Answers: angle of internal friction 300 (**full mark must be given for 300+50 or300-50 ,Since it is graphical representation. Mark must be given for the steps followed**.) -5 marks | |  |
|  |  | Angle made by the failure plane with horizontal & direction of maximum shear stress --- 600(**mark must be given for 600 +5or 600-5,(Since it is graphical representation.**) -4 marks | |  |
| 6 | a) | any 4 merits of triaxial test over direct shear test -- *6marks* | | 6 |
|  | b) | Eqns. for ‘k’ in falling head test & average ‘k’ perpendicular to bedding planes --*3marks* | | 9 |
|  |  | Steps –*2marks* |  |  |
|  |  | Ans: k of layered soil =10-6 mm/sec--*2marks* | |  |
|  |  | Ans.:time taken for the head to fall from 500mm to 100mm =4710hrs- --*2marks*  **(full mark must be given for the answer in other proper units)** | |  |
|  |  | **PART C**  **Answer any two full questions, each carries 20 marks** | |  |
| 7 | a) | Eqn. of height of solids and determination of height of solids=10mm – *4marks*  Determination of equilibrium void ratio for various pressures --- *6 marks*   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Pressure | 0 | 25 | 50 | 100 | 200 | 400 | 800 | | Void ratio | 1.0 | 0.75 | 0.71 | 0.65 | 0.50 | 0.35 | 0.20 |   Drawing of e-log p graph -- *6marks*  Compression index equation &values *(Cc=0.498)-*-*4marks* | | 20 |
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| 8 | a | Eqns. of dry density, OMC,degree of saturation, percentage air voids & G– *3marks*  Steps – 4 marks  Degree of saturation =90% Percentage air void=2% -*4 marks*  theoretical maximum dry densityAns=20.41kN/m3 - 3 *marks* | | 14 |
|  |  |  |
|  |  |  |
|  |  |  |
|  | b | Meaning of factor of safety with respect to cohesion-*3 marks*  When does it become equal to factor of safety with respect to shear strength?(When φ of the soil =zero ) --*3marks* | | 6 |
|  |  |  | |  |
| **9** | a | Stating the method of determination of pre-consolidation pressure -- *4marks.* | | 10 |
|  |  | graph -- *6marks* | |  |
|  | b | Forces considered in friction circle method of slope analysis =*10 marks***(since Improving slope stability method is out of syllabus )** | | 10 |