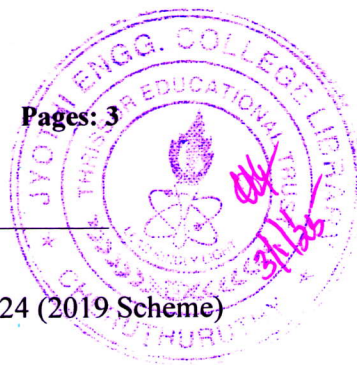


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S4 (PT) (S, FE) / S4 (WP) (S) Examination December 2024 (2019 Scheme)

**Course Code: CET204****Course Name: GEOTECHNICAL ENGINEERING – I**

Max. Marks: 100

Duration: 3 Hours

(Graph sheets can be used)

PART A*(Answer all questions; each question carries 3 marks)*

		Marks
1	Explain sensitivity and Thixotropy.	3
2	With a three phase diagram define void ratio and porosity.	3
3	Draw particle size distribution curve representing well graded, poorly graded and gap graded soils.	3
4	What is seepage velocity?	3
5	What do you mean by critical hydraulic gradient?	3
6	List out the assumptions and limitations of Boussinesq's equation	3
7	List out any 3 difference between compaction and consolidation	3
8	What is zero air void line?	3
9	Explain UU, CU and CD tests.	3
10	Explain toe failure, base failure and slip failure.	3

PART B*(Answer one full question from each module, each question carries 14 marks)***Module -1**

- 11 a) Derive the expression $\gamma_{sat} = \frac{(G+e)\gamma_w}{(1+e)}$ 6
- b) A chunk of moist soil weights 10kg and its volume is $0.00625m^3$. After oven drying, the mass reduces to 8 kg. Determine the water content, density of moist soil, dry density and porosity. Take $G=2.65$. 8
- 12 a) Derive the relationship between γ and γ_d 4
- b) Write down the procedure for determining field density by core cutter method and sand replacement method. When do you prefer sand replacement method, why? 10

Module -2

- 13 a) A soil has a liquid limit of 28% and a flow index of 14%. If the plastic limit is 18%, determine the plasticity index and the toughness index. If the natural water content is 20% find liquidity index and relative consistency 8
- b) Draw IS plasticity chart and mark the details. What is its practical application. 6
- 14 a) A soil stratum consists of 3 horizontal layers of equal thickness. The magnitude of coefficient of permeability for the upper, middle and lower layers is 4.5×10^{-4} cm/sec, 6.5×10^{-5} cm/sec and 6.8×10^{-6} cm/sec respectively. What is the ratio of the average permeability of the bed in the horizontal and vertical direction? 9
- b) Explain any 5 factors that affect coefficient of permeability. 5

Module -3

- 15 a) With a neat sketch explain Quick sand condition. 4
- b) A sand deposit consists of two layers, the top layer is 2.5 m thick ($\rho = 1700 \text{ kg/m}^3$;) and bottom layer is 3.5 m thick ($\rho_{\text{sat}} = 2000 \text{ kg/m}^3$). The water table is at a depth of 2.5 m from the surface. Draw the diagram showing the variation of total stress, neutral stress and effective stress. 10
- 16 a) Explain Newmark's chart. 7
- b) Calculate the vertical stress at a point P at a depth of 4 m directly under the centre of the circular ring type foundation of inner diameter 5m and external diameter 10m, subjected to a pressure of 100kPa. 7

Module -4

- 17 a) Explain the procedure for determining pre-consolidation pressure. 6
- b) A 20 mm thick laboratory soil sample takes 20 minutes for 20% consolidation, under double drainage condition. Find the time taken for a 20m thick soil layer in the field to reach 50% consolidation, if drainage is allowed only in one direction. 8
- 18 a) Write about control of compaction. 6
- b) Table below gives the light compaction test results 8

The mould is 1000ml capacity. The specific gravity of the soil particle is 2.65. Plot

Water content (%)	8.50	10.50	11.50	13.50	14.50
Wt. of compacted soil in the mould (g)	1900	2100	2160	2120	2080

(i) compaction curve (ii) Zero air void line (iii) 90% saturation line

Module -5

- 19 a) Explain the merits and limitations of triaxial test. 4
- b) The following data were obtained in a direct shear test. At failure, Normal pressure is 25 kN/m^2 and tangential pressure is 20 kN/m^2 . Cohesion of the soil is 12 kN/m^2 . Represent the data by Mohr circle and compute the principal stress and direction of principal planes. 10
- 20 a) What is meant by stability number and stability chart? 6
- b) Discuss with necessary sketches the friction circle method of analysis 8
