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B.Tech. DEGREE EXAMINATION, NOVEMBER 2023
Sixth Semester

**18CEO311J – COMPUTER APPLICATION IN GEOTECHNICAL AND
TRANSPORTATION ENGINEERING**

(For the candidates admitted from the academic year 2020-2021 & 2021-2022)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
- (ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO
1. Mohr Coulomb model is a	1	1	1	1
(A) Linear elastic model				
(B) Plastic model				
(C) Elasto-plastic model				
(D) Hardening social model				
2. Based on the method of load transfer, pile foundations are classified as	1	1	1	1
(A) Driver piles and Bored piles				
(B) Bored piles and cast-in-situ piles				
(C) Wooden and concrete piles				
(D) Friction piles and End bearing piles				
3. The depth to width ratio for shallow foundation is	1	1	1	1
(A) Less than or equal to 1				
(B) Greater than 2				
(C) Less than or equal to 6				
(D) Greater than or equal to 1				
4. The major foundation problem encountered with leaning tower of pisa	1	1	1	1
(A) Bearing capacity failure				
(B) Sliding failure				
(C) Punching failure				
(D) Settlement failure				
5. The application of geostudio which is used in the analysis of slope is	1	3	2	5
(A) SEEP/W				
(B) CTRAN/W				
(C) SLOPE/W				
(D) QUAKE/W				
6. Of the many slip surfaces calculated, the slip surface with the least factor of safety is defined as	1	2	2	2
(A) Finite slope				
(B) Base failure				
(C) Critical slip surface				
(D) Infinite slope				
7. The slopes that are extended over a long distance and the conditions that remain identical along some surface or surfaces for quite some distances is described as	1	1	2	1
(A) Finite slopes				
(B) Infinite slopes				
(C) Man-made slopes				
(D) Artificial slope				

8. The factor of safety is defined as the ratio _____, where F_r is the resisting force and F_d is the driving force
 (A) F_r / F_d (B) $(F_r + F_d) / F_d$
 (C) $(F_r - F_d) / F_d$ (D) $(F_r - F_d) / F_r$
9. Which of the below is not a terrain classification?
 (A) Rolling terrain (B) Plain terrain
 (C) Hilly terrain (D) Undulating terrain
10. The parameter that least affects the geometric design and alignment of highway is _____.
 (A) Speed (B) Number of lanes
 (C) Set back distance (D) Thickness of pavement
11. The design speed of National highway in plain terrain is
 (A) 100 kmph (B) 80 kmph
 (C) 60 kmph (D) 120 kmph
12. The vertical gradient of highway is limited to
 (A) Limiting gradient (B) Ruling gradient
 (C) Drainage gradient (D) Exceptional gradient
13. The cluster analysis is performed using the _____ modeling.
 (A) Microscopic (B) Mesoscopic
 (C) Macroscopic (D) Microscopic and mesoscopic
14. Select the situation that does not require the traffic simulation techniques
 (A) To view the vehicle flow animation to understand how the system behaves
 (B) Congested conditions persists over a significant time
 (C) To view the flow in the signal (D) Traffic sign board implication
15. Which of the following parameters are linearly related?
 (A) Speed and density (B) Flow and density
 (C) Flow and speed (D) Density, flow and speed
16. The output of simulation corresponding to the network element is
 (A) Flow (B) Link
 (C) Time (D) Cost of travel
17. Thermal stress in the rigid slab is maximum at _____.
 (A) The neutral axis (B) The extreme fiber of the slab
 (C) $1/4^{\text{th}}$ of the depth from neutral axis (D) 2 mm from neutral axis
18. Which of the below strain induces rutting in subgrade layer?
 (A) Vertical strain at the surface of the pavement
 (B) Horizontal strain at the surface of the pavement
 (C) Vertical strain at the top of subgrade
 (D) Horizontal strain at the top of subgrade

19. The stress/strain for the design of flexible pavement are determined assuming all the layers as	1	2	5	1
(A) Viscoelastic				
(B) Linearly elastic				
(C) Visco plastic				
(D) Non linear elastic				
20. Which of the below is the standard axle load?	1	1	5	1
(A) 80 kN, single axle dual wheel				
(B) 64 kN, single axle single wheel				
(C) 148 kN, tandem axle				
(D) 224 kN, tridem axle				

PART – B (5 × 4 = 20 Marks)

Answer ANY FIVE Questions

	Marks	BL	CO	PO
21. State the different modes of failure of shallow foundation.	4	2	1	1
22. Enumerate on the classification of piles based on various category.	4	2	1	1
23. Name any two methods of slope stability analysis and describe their basic differences in assumption.	4	2	2	1
24. Explain different types of gradient in highway and highlight the recommended values for national highway in plain terrain.	4	3	3	1
25. Explain the influence of terrain type in the geometric design of highway.	4	2	4	1
26. Enumerate the step by step process involved in the simulation of traffic flow at the intersection.	4	2	4	1
27. Bring out the assumptions made in the analysis of flexible pavement.	4	2	5	1

PART – C (5 × 12 = 60 Marks)

Answer ALL Questions

	Marks	BL	CO	PO
28. a.i. Explain the concept of plane strain and axisymmetric analysis in PLAXIS 2D. Under what condition these analysis are adopted.	6	1	3	1
ii. List out the prerequisite for foundation design.	6	1	2	1
(OR)				
b. Explain various soil models in detail and with suitable illustration.	12	1	3	1
29. a. Enumerate the problem definition input and analysis steps in 'GEOSTUDIO' for solving slope stability problem.	12	2	3	1
(OR)				
b.i. What are factors affecting factor of safety of slope stability.	4	2	2	1
ii. Describe the various failure associated with the location of failure surface with suitable illustration.	8	3	2	1

30. a. Enumerate the step by step process involved in the horizontal alignment of highway. 12 3 3 1

(OR)

- b. Explain the step by step process in the vertical alignment of highway. 12 3 3 1

31. a. Discuss the simulation steps involved in simulation of uninterrupted traffic flow. 12 2 4 1

(OR)

- b. Given with a specific traffic control measure, how will you understand the behavioral change in the traffic flow parameters using simulation techniques? 12 3 4 1

32. a. Explain the step by step input that you will give for solving the below problem. 12 3 5 1

A three-layer system has an HMA surface with $h_1 = 127$ mm and $E_1 = 3.5$ GPa; a granular base with $h_2 = 305$ mm and $E_2 = 62$ MPa and a soft subgrade with $E_2 = 21$ MPa. Determine the tensile strains at the bottom of asphalt layer and the compressive strain on the top of subgrade.

(OR)

- b. For a set of dual-tandem wheels with a total weight of 182 kN (45.5 kN/per wheel), a tire pressure of 0.7 N/mm^2 , a dual spacing of 50 cm and a tandem spacing 100 cm. The concrete slab is 20 cm thick, and the Modulus of subgrade reaction is 27 MN/m^3 . Explain the step by step input that you will give in configuring the load and node arrangements for the rigid slab analysis in the determination of stress due to interior loading in Y direction at point under the center of the dual tandem wheels. 12 3 5 1

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