Ref. No. Ex/CE/5/T/403/2024(S)

Bachelor of Engineering (Civil Engineering)

[4th Year; 1st Semester Supplementary Examination - 2024]

Soil Mechanics II

Total Time: Three Hours

Full Marks 100
(Part I: 50 + Part II: 50)

Use a separate Answer-Script for each part

PART I (50 Marks)

Q. No.	**(Answer all the questions.)** **[Assume any data reasonably if necessary]**	**Marks**
1. (a)	In Terzaghi's bearing capacity theory, briefly discuss on different failure zones below foundation with neat a sketch.	
(b)	The subsoil at a building site consists of medium sand with $\gamma_{bulk} = 17.3\ kN/m^3$, $\gamma_{sat} = 19.1\ kN/m^3$, $c' = 0$ and $\varphi' = 32^\circ$. A 2.0 m wide strip footing is to be placed at 1.2 m below ground surface. Compute the net safe bearing capacity with a factor of safety of 3 for a water table location of: (a) 1.5m below ground surface (b) at the ground surface [Use Terzaghi's Bearing Capaity Theory]	[8+10]
2. (a)	Describe the 'Plate Load Test' in connection with determination of bearing capacity and settlement of soil with neat sketches.	
(b)	Discuss different phases of subsoil exploration.	[8+8]
4. (a)	Define area ratio, inside clearance and outside clearance in connection with a sampler in subsoil exploration with a neat sketch.	[6+10]
(b)	Define SPT-N value. Discuss IS recommended corrections for SPT 'N' value.	

[Turn over

Ex/CE/5/T/403/2024(S)

BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
FOURTH YEAR FIRST SEMESTER SUPPLEMENTARY EXAM
2024
SOIL MECHANICS-II
PART-I

Full Marks 100
(50 marks for this part)

Q. No.	(Answer all the questions.) [Assume any data reasonably if necessary]	Marks

Terzaghi's Bearing Capacity Factors

ϕ'	N_c	N_q	N_γ*	ϕ'	N_c	N_q	N_γ*
0	5.70	1.00	0.00	26	27.09	14.21	9.84
1	6.00	1.10	0.01	27	29.24	15.90	11.60
2	6.30	1.22	0.04	28	31.61	17.81	13.70
3	6.62	1.35	0.06	29	34.24	19.98	16.18
4	6.97	1.49	0.10	30	37.16	22.46	19.13
5	7.34	1.64	0.14	31	40.41	25.28	22.65
6	7.73	1.81	0.20	32	44.04	28.52	26.87
7	8.15	2.00	0.27	33	48.09	32.23	31.94
8	8.60	2.21	0.35	34	52.64	36.50	38.04
9	9.09	2.44	0.44	35	57.75	41.44	45.41
10	9.61	2.69	0.56	36	63.53	47.16	54.36
11	10.16	2.98	0.69	37	70.01	53.80	65.27
12	10.76	3.29	0.85	38	77.50	61.55	78.61
13	11.41	3.63	1.04	39	85.97	70.61	95.03
14	12.11	4.02	1.26	40	95.66	81.27	115.31
15	12.86	4.45	1.52	41	106.81	93.85	140.51
16	13.68	4.92	1.82	42	119.67	108.75	171.99
17	14.60	5.45	2.18	43	134.58	126.50	211.56
18	15.12	6.04	2.59	44	151.95	147.74	261.60
19	16.56	6.70	3.07	45	172.28	173.28	325.34
20	17.69	7.44	3.64	46	196.22	204.19	407.11
21	18.92	8.26	4.31	47	224.55	241.80	512.84
22	20.27	9.19	5.09	48	258.28	287.85	650.67
23	21.75	10.23	6.00	49	298.71	344.63	831.99
24	23.36	11.40	7.08	50	347.50	415.14	1072.80
25	25.13	12.72	8.34				

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Part II (50 Marks)

Answer all in brief and to-the-point

1. (a) What is Taylor's Stability Number and how it is useful in Geotechnical Engineering? Explain the steps involved in Swedish Slip Circle method for determining the Stability of Slopes for $\Phi = 0$ with neat sketch. (2+5)

   (b) A soil mass EBD, having $c = 8$ kN/m², $\emptyset = 20°$, and $\gamma = 19$ kN/m³ is rested on an inclined impermeable clay layer (BEA) as shown in the figure. Determine the FOS against wedge failure along EB. (10)

2. (a) Differentiate the Rankine and Coulomb Earth Pressure Theories. (2+5)

   Explain in detail, with the help of Mohr circles, the occurring of minimum and maximum earth pressures. What would be the inclination of the failure planes developed in each case?

   (b) A 6 m high vertical supports a saturated, cohesive backfill with horizontal surface. The top 3 m of the backfill weights 18 kN/m³ and has an apparent cohesion of 18 kN/m². The bulk unit weight and apparent cohesion of the bottom 3 m of the backfill are respectively 20 kN/m³ and 24 kN/m². What is the likely depth of tension cracks behind the wall? If tension cracks develop, what would be the total active pressure? Draw the pressure distribution diagram and determine the point of application of the resultant pressure. (10)

3. Define the 'Equivalent Point Load Method'. The Fig. 2 shows a uniformly loaded (500 kN/m²) ground ABCDEFA. With the help of the Newark's Chart determine the distributed stress on a point 5 meter below (vertically) the corner point F. Compare the stress intensities obtained by 'Equivalent Point Load Method' and through the 'Newmarks' Chart'. (16)

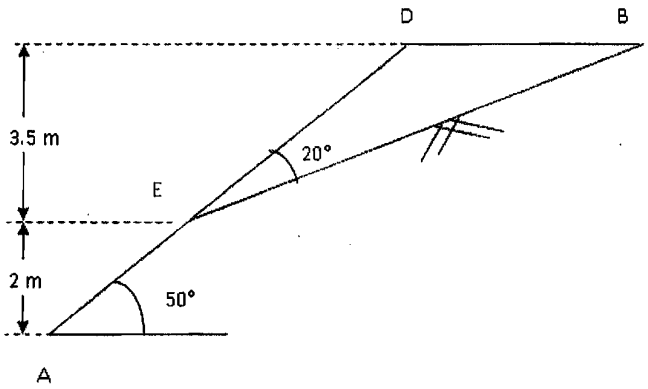

Fig. 1 Problem Geometry (Q. 1b)

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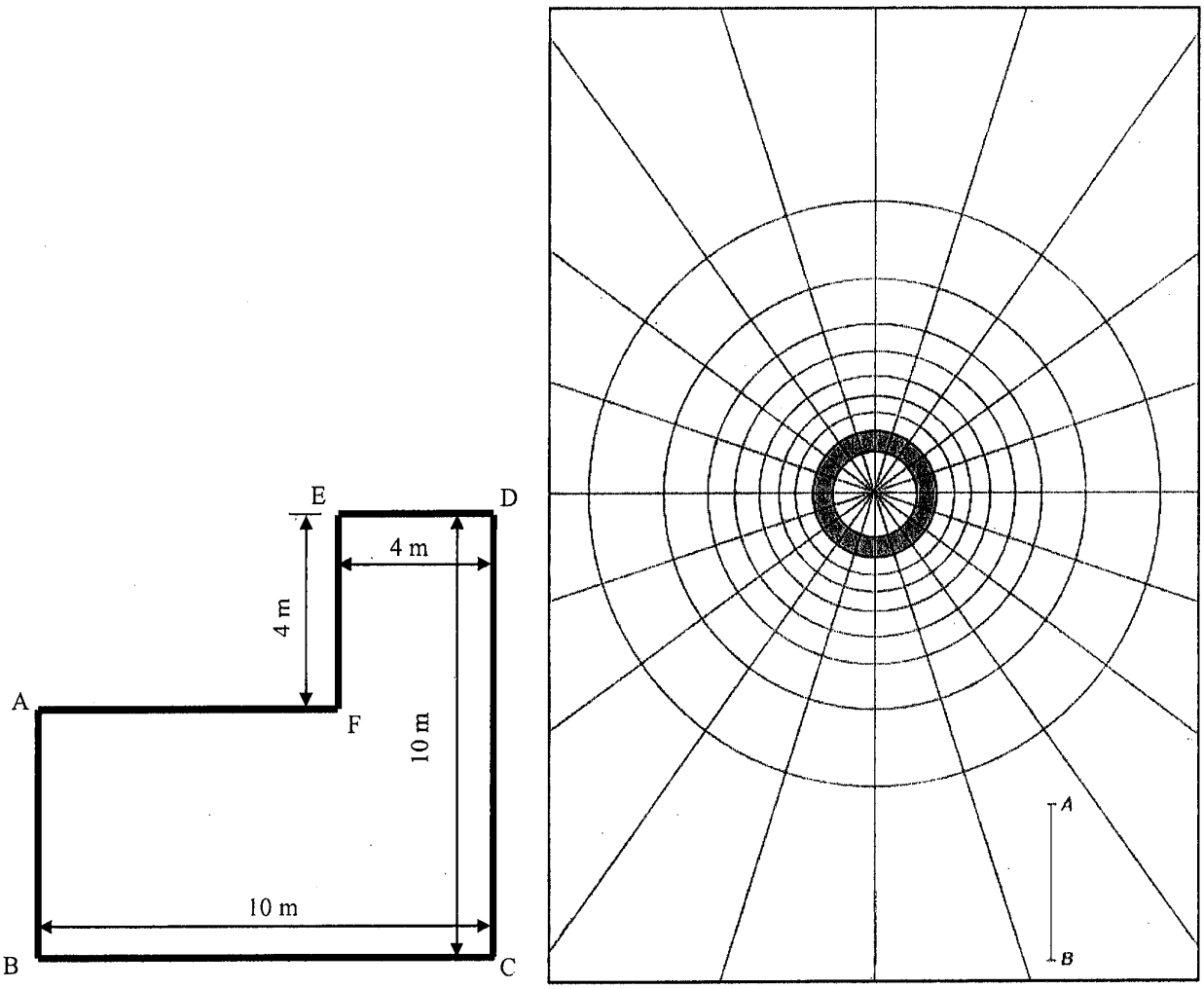

Fig. 2 Uniformly loaded area and Newmarks' Chart (Q. 3)