

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

Time : Three Hours

Full Marks 100
(50 marks for this part)

Q. No.	(Answer all the questions.) [Assume any data reasonably if necessary]	Marks
1. (a) (b)	Write down the assumptions associated with Terzaghi's bearing capacity theory. Determine the ultimate, net ultimate and net safe bearing capacity of a square footing resting on sandy soil with the following details: (i) Depth of footing (d_f) = 1.25m (ii) Width of footing (B) = 2m x 2m (iii) Unit wt. of soil (γ) = 18.2 kN/m ³ (iv) $\phi' = 32^\circ$ (v) $c' = 0$ [Consider water table at 0.5m depth from GL; Use Terzaghi's theory]	[6+8]
2. (a) (b)	Discuss how the eccentricity of loading affects the contact pressure distribution below a shallow foundation with neat sketches. In this connection discuss the 'effective area' method of Meyerhof to account the eccentricity of loading in bearing capacity calculation. Discuss the limitations of Plate load test.	[6+4]
3. (a) (b) (c)	Classify different subsoil exploration methods. Write a short note on 'Depth of boring' in connection with subsoil investigation. Discuss rotary drilling and percussion drilling in subsurface exploration.	[2+6+6]
4. (a) (b)	Define (i) disturbed, (ii) undisturbed, (iii) disturbed non-representative and (iv) disturbed representative soil sample. Discuss the advantages and disadvantages of standard penetration test (SPT) and static cone penetration test (SCPT)	[4+8]

[Turn over

BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
FOURTH YEAR FIRST SEMESTER 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				

Bachelor of Engineering (Civil Engineering)
 [4th Year; 1st Semester 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 - II (Marks : 50)

Answer all in brief and to-the-point

1. (a) How 'Finite' and 'Infinite' slope can be distinguished? Derive, with the help of a neat sketch, the expression for the factor of safety for an infinite slope of sandy soil without any seepage condition. Use common nomenclatures for your derivation. (1+6)
- (b) An infinite slope is made of clay with the following properties: $\gamma_t = 18 \text{ kN/m}^3$; $\gamma' = 9 \text{ kN/m}^3$; $c' = 25 \text{ kN/m}^2$; $\phi' = 28^\circ$. If the slope has an inclination of 35° and height equal to 12 m, determine the stability of the slope, when (i) the slope is submerged, and (ii) there is seepage parallel to the slope. (8)
2. (a) Differentiate the Rankine and Coulomb Earth Pressure Theories. (2+5+1)
 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 smooth vertical wall, 4 m high, retains a soil with $c' = 25 \text{ kN/m}^2$ and $\gamma = 18 \text{ kN/m}^3$. The horizontal backfill surface carries a uniform surcharge load of 50 kN/m^2 . If the retaining wall is caused to move toward the soil sufficiently to mobilize the passive resistance, draw the pressure distribution diagram. Determine the magnitude and the point of application of the total passive pressure. (7)
3. Define the 'Equivalent Point Load Method'. The Fig. 1 shows a uniformly loaded (100 kN/m^2) 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'. (20)

[Turn over

Bachelor of Engineering (Civil Engineering)
[4th Year; 1st Semester 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

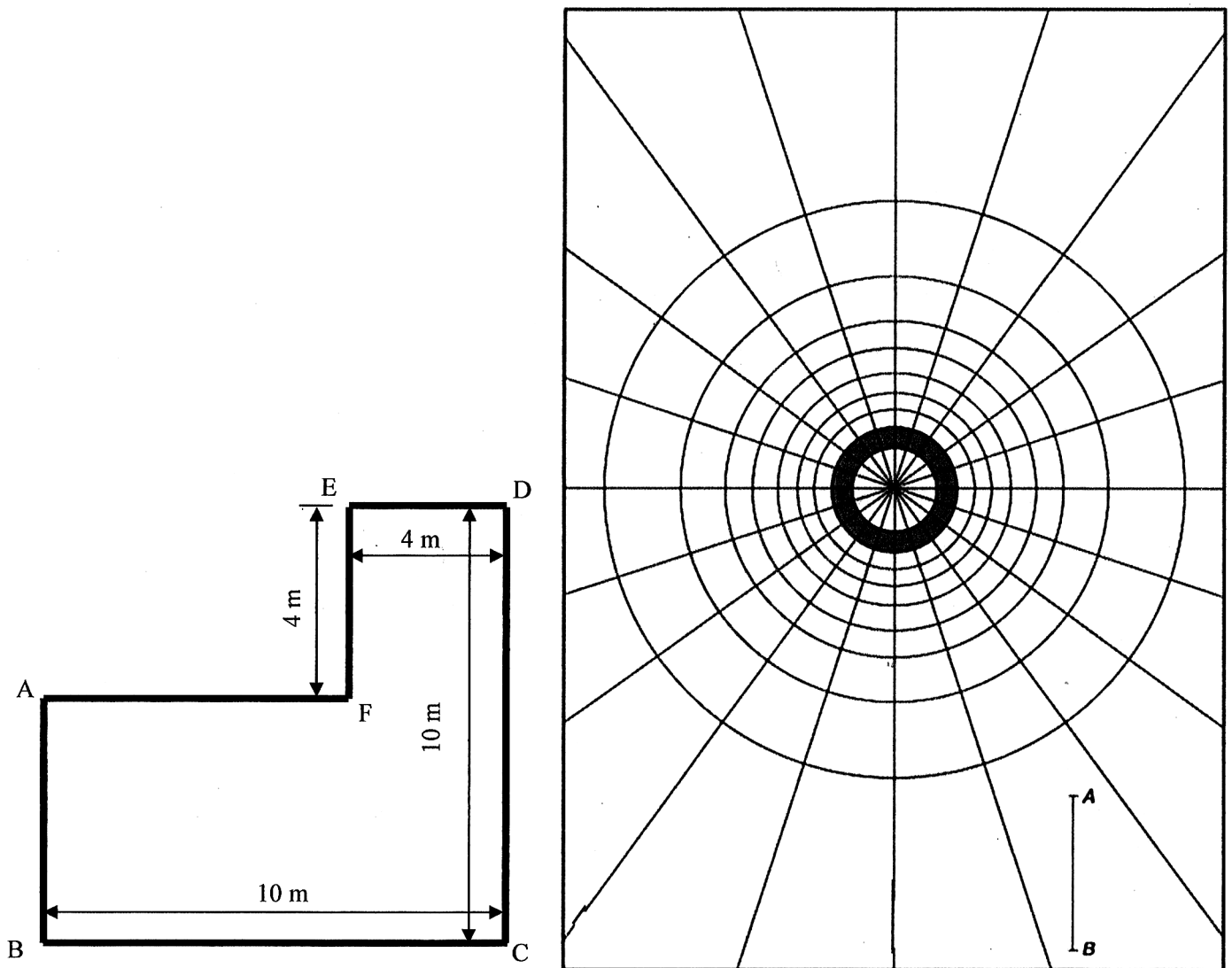


Fig. 1 Uniformly loaded area (Q. 5) and Newmarks' Chart