VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD
Accredited by NAAC with A++ Grade
B.E. (Civil Engg.) VII-Semester Supplementary Examinations, July-2022
Foundation Engineering (PE-II)

Time: **3 hours**   Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	**Interpret** the statement "A excavation is considered to be deep if depth of excavation is >6m"	2	1	1	1,2
2.	**Sketch** apparent earth pressure diagram of a cohesion less soil	2	1	1	1,2
3.	**List** the functions of geosynthetics	2	1	2	1,2
4.	It is proposed to construct structure in the Himalayan region which falls in Seismic Zone-V (Z is 0.36 Table 2 of IS: **1893**). Assume that the foundation consists of rocky strata. The period of vibration may be assumed as 2 seconds. The ratio I/R may be taken as unity. **What** is the seismic acceleration factor within the reinforced soil?	2	2	2	1,2
5.	List any five laboratory tests versus type of sample would be required.	2	1	3	1,5
6.	Find percentage of internal clearance of a sampler with following dimensions D1= 34.9;D2=50.8mm;D3=40mm ;D4=45mm	2	1	3	1,2,5
7.	**What** is significant depth? Explain with a sketch	2	1	4	1

8.	List school of thoughts based on which one can differentiate LSF,GSF& PSF	2	1	4	1
9.	What is negative skin friction? In which soils this phenomenon is manifested?	2	1	5	1
10.	Explain suitability of dynamic pile load test in clays	2	2	5	1

Part-B (5 × 8 = 40 Marks)

11. a)	Compare fixed and free earth supports	2	2	1	1
b)	Solve for the depth of embedment of sheet pile below dredge level without increasing it to accommodate FOS, for an anchored sheet pile driven in cohesion less soil of C=0; Φ =30^0 and γ= 20 kN/m^3. Consider depth of dredge level from O.G.L as 6m and depth of anchor as 1.5 m. Assume soil retained has same properties as soil below dredge level. Considering original ground level as datum Reduced level of dredge level is -6m	6	3	1	1,2
12. a)	List geosynthetics suitable for drainage	2	1	2	1
b)	A 5 m high wall supports soil with horizontal backfill. Properties of backfill are C=0; Φ =30^0 and γ= 15 kN/m^3 whereas for the reinforced fill C=0; Φ =35^0 and γ= 20 kN/m^3. The initial length of reinforcement is 5m. The permanent and live surcharges are 15kPa and 25kPa respectively. i. What is the total lateral force for the design ii. What the additional seismic force and the additional overturning moment to be considered for external stability calculations as per FHWA?	6	2	2	1,2,3
13.	Explain the following with neat sketches. i) Auger boring ii) Percussion boring iii) Wash boring iv) Rotary drilling	8	2	3	1,2,5,7
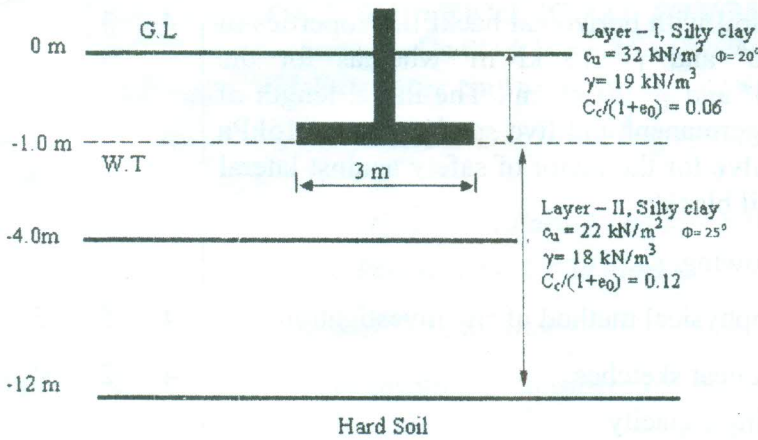
14.		8	3	4	1,2,3

Consider shallow foundation in the figure failing under **GSF** condition. **Solve for** net safe bearing capacity with a FOS 1.5 in the following situations of Ground water level

     i)   GWT is at 0 m elevation

     ii)   GWT is at -1m elevation

     iii)   Water table 0.5m below G.L

     iv)   GWT is at -4m elevation

     v)   GWT is at -10m elevation

ϕ	General shear failure			Local shear failure		
	N_c	N_q	N_γ	N_c'	N_q'	N_γ'
0	5.7	1.0	0.0	5.7	1.0	0.0
5	7.3	1.6	0.5	6.7	1.4	0.2
10	9.6	2.7	1.2	8.0	1.9	0.5
15	12.9	4.4	2.5	9.7	2.7	0.9
20	17.7	7.4	5.0	11.8	3.9	1.7
25	25.1	12.7	9.7	14.8	5.6	3.2
30	37.2	22.5	19.7	19.0	8.3	5.7
34	52.6	36.5	35.0	23.7	11.7	9.0
35	57.8	41.4	42.4	25.2	12.6	10.1
40	95.7	81.3	100.4	34.9	20.5	18.8
45	172.3	173.3	297.5	51.2	35.1	37.7
48	258.3	287.9	780.1	66.8	50.5	60.4
50	347.5	415.1	1153.2	81.3	65.6	87.1

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15. a)	A pile group consists of 9 piles in square pattern. UCC of clay is 100 kPA and unit density is 18 kN/m3. The diameter of each pile is 0.5m and the embedded length is 10 m. C/C pile spacing is 1.0m. **Find** allowable block capacity of group (in kN) using FOS 3.0. Assume Adhesion factor 0.9.	6	4	5	1,2,5
b)	**What** is the purpose of cyclic pile load test	2	1	5	1
16. a)	**Solve** for the total active force and point of action above point of zero net pressure, for an anchored sheet pile driven in cohesion less soil of C=0; $\Phi = 30^0$ and $\gamma = 20$ kN/m³. Consider depth of dredge level from O.G.L as 6m and depth of anchor as 1.5 m. Assume soil retained has same properties as soil below dredge level. Considering original ground level as datum Reduced level of dredge level is -6m	4	3	1	1

b)	A 5 m high wall supports soil with horizontal backfill. Properties of backfill are C=0; Φ =30^0 and γ= 15 kN/m^3 whereas for the reinforced fill C=0; Φ =35^0 and γ= 20 kN/m^3. The initial length of reinforcement is 5m. The permanent and live surcharges are 15kPa and 25kPa respectively. **Solve** for the factor of safety against lateral sliding of the reinforced soil block?	4	3	2	1,2

17. Answer any *two* of the following:

a)	**Explain** in detail about geophysical method of site investigation	4	5	3	1,2

b)	**Explain** the following with neat sketches.
	  i. Allowable bearing capacity
	  ii. Terzaghi's bearing capacity theory
		4	2	4	1,23

c)	A singly under-reamed, 8-m long, RCC pile (shown in the adjoining figure) weighing 20 kN with 350 mm shaft diameter and 750 mm under-ream diameter is installed within stiff, saturated silty clay (undrained shear strength is 50 kPa, adhesion factor is 0.3, and the applicable bearing capacity factor is 9) to counteract the impact of soil swelling on a structure constructed above. Neglecting suction and the contribution of the under-ream to the adhesive shaft capacity, **what** would be the estimated ultimate load capacity of the pile?	4	2	5	1,2

8000 mm

400 mm

350 mm

750 mm
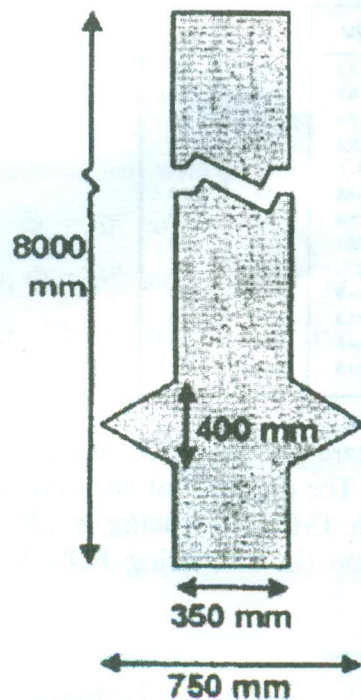
M : Marks;   L: Bloom's Taxonomy Level;   CO; Course Outcome;   PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	30%
iii)	Blooms Taxonomy Level – 3 & 4	50%

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