MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

MKC

CIVIL

2021-22

Course Code & Course Name : 19CEE12 & Foundation Engineering

Year/Sem/Sec : III/V/-

S.No	Term	Notation (Symbol)	Concept/Definition/Meaning//Equation/ Expression	Units
UNIT - I SITE INVESTIGATION AND SELECTION OF FOUNDATION				
1	Auger Boring	-	This method is fast and economical, using simple, light, flexible and inexpensive instruments for large to small holes.	-
2	Bore Log Report	-	Bore log gives a summary of ground conditions. It provides the soil layers.	-
3	Boring	-	Making and advancing of boreholes is known as boring	-
4	Disturbed Sampling	-	Sample which contain all constituents of the soil in their proper proportion.	-
5	Depth Factor	-	The ratio between the depth of a slip circle below the top of a slope and the height of the slope.	-
6	Excavation	-	The mechanical removal of earth material also referred to as cut material.	-
7	Foundation	-	That part of the structure that supports the weight of the structure and transmits the load to underlying soil or rock.	-
8	SCPT Cone Penetration Test	-	A penetration test in which a cone that has a 600 point is pushed into the ground at a continuous rate.	-
9	Site Investigation	-	Site investigation is done for obtaining the information about subsurface condition at the site.	-
10	Significant Depth	-	Exploration depth, in general it should be carried out to a depth up to which increase in the pressure.	-
11	Soil Exploration	-	The knowledge of subsoil conditions at a site for safe and economical design of substructures elements.	-
12	SPT	-	The number of blows required to drive a split-spoon sampler during a standard penetration test.	-

13	Undisturbed Sampling	-	Samples which retain the original structure; properties like water content void ratio is not changed.	-
14	Overburden Pressure	-	The over burden pressure increase with depth for the same relative density of sand.	-
15	Classification of soil exploration	-	General or preliminary exploration Detailed exploration of soil	-
16	Boring or semi direct method	-	Drilling bore holes into the ground with the view to obtaining soil at specific depth	-
17	types of auger	-	Post hole auger Helical auger	-
18	Steps in soil exploration	-	Fixing the depth of exploration Measuring the ground water levels	-
19	Types of soil samplers	-	Disturbed samples Undisturbed samples	-
20	Thick sampler	-	Split tube sampler	-
21	Classification based on mode of operation	-	Open drive sampler Rotary sampler	-
22	Standard penetration test	-	Sampling tube is used to penetrate the soil	-
23	Vane shear test	-	It is used to determine the shear strength of the soil	-
24	Inside clearance	CI	[(DS-DC) /DC]*100%	-
25	Outside clearance	C0	[(Dw-DT) /DT]*100%	-
UNIT - II SHALLOW FOUNDATION				
26	Allowable Bearing Pressure	-	The maximum allowable bearing pressure for the design of foundations.	-
27	Allowable Settlements	-	The allowable maximum settlement depends upon the type of soil, the type of foundation .	-
28	Bearing Capacity	-	The supporting power of a soil or rock is referred to as its bearing capacity.	-
29	BIS Formula	q_{unet}	$c\ N_c\ S_c\ dc\ i_c + \gamma\ D_f\ (Nq - 1)\ S_q\ d_q\ i_q + 0.5\ \gamma\ B\ N_\gamma\ S_\gamma\ d_\gamma\ , i_\gamma$	-
30	Plate Load Test	-	Plate load test is field test to determine the bearing capacity of soils.	-

31	Settlement	-	The permanent downward vertical movement experienced by structures. .	-
32	Shallow Foundations	-	Depth of foundation is less than or equal to its width.	-
33	Terzaghi's Formula	q_{unet}	$c\ N_c + \gamma\ D_f\ \ (N_q - 1) + 0.5\ \gamma\ \ B\ N_\gamma$	-
34	Allowable Bearing Capacity	-	It is the net loading intensity at which neither the soil fails in shear nor there is excessive settlement.	-
35	Ultimate Bearing Capacity	-	The bearing pressure that causes failure of the soil or rock supporting the foundation.	-
36	Bearing Capacity Failure	-	A foundation failure that occurs when the shear stresses in the adjacent soil exceed the shear strength.	-
37	Consolidation (Settlement)	-	The settlement of a foundation due to squeezing out of water from the pores.	-
36	Initial Or Immediate Settlement	-	Initial settlement of the structure caused by un drained shear deformations.	-
39	Primary Consolidation	-	The compression of clays under load that occurs as excess pore water pressures slowly dissipate with time	-
40	Secondary Compression	-	The final component of settlement, which is that part of the settlement.	-
41	Differential Settlement	-	The vertical displacement due to settlement of one point in a foundation.	-
42	Total Settlement	-	The absolute vertical movement of the foundation.	-
43	Shear Failure	-	A failure in a soil or rock mass caused by shearing strain along one or more slip (rupture) surfaces.	-
44	General Shear Failure	-	A failure in which the shear strength of the soil or rock is mobilized along the entire slip surface.	-
45	Local Shear Failure	-	A failure in which the shear strength of the soil or rock is mobilized only locally along the slip surface.	-
46	Punching Shear Failure	-	Shear failure where the foundation pushes (or punches) into the soil due to the compression of soil.	-
47	Isotropic	-	A soil mass having essentially the same properties in all directions.	-
48	Unit weight of soil	-	Density of soil more than the bearing capacity of soil also increases.	-

49	Pressure Intensity	-	Pressure intensity = $\frac{\text{Load applied}}{\text{Base area of plate}}$	-
50	Settlement of foundation	s_F	$\left[\frac{B(B+0.3)}{B_P(B+0.3)}\right]^2$	mm
UNIT - III FOOTINGS AND RAFTS				
51	Contact Pressure	-	Soil reaction produce a upward pressure	-
52	Circular Footing	-	Isolated/ spread footing that is circular shaped. Usually a shallow footing	-
53	Continuous Footing	-	A horizontally long footing supporting a wall.	-
54	Deep Foundation	-	A foundation that derives its support by transferring loads to soil at some depth below the structure.	-
55	Expansive Clays	-	Also, Reactive Clays. Clays those are sensitive to water, causing them to swell or expand.	-
56	Floating Foundation	-	The weight of the building approximately equal to the full weight of soil and water removed from the site.	-
57	Footings	-	An enlargement at the base of a foundation that is designed to transmit forces to the soil.	-
58	Isolated Footing	-	Also, spread or pad footing. A footing designed to support a structural load from a single column.	-
59	Shallow Foundation	-	A foundation that derives its support by transferring load directly to soil or rock at a shallow depth.	-
60	Rafts Or Mat	-	A structural slab utilized as a footing, which usually encompasses the entire building footprint.	-
61	Expansive Clays	-	Also, Reactive Clays. Clays those are sensitive to water, causing them to swell or expand.	-
62	Swell	-	Increase in soil volume; volumetric expansion of particular soils due to changes in water content.	-
63	Assumption used in design of strap footing	-	P_1 & P_2 be the loads on column C_1 & C_2 be the width of column	-
64	Total load acting on footing	Q	$P_1 + P_2$	-
65	Skempton's equation	q_{nf}	$5\left(1 + 0.2\frac{D}{B}\right)\left(1 + 0.2\frac{B}{L}\right)C$	KN/m^2
66	Design of raft foundation	-	1) Conventional rigid method 2) Elastic method (or) soil line method	-

67	Elastic method (or) approximate flexible method	-	Simplified elastic formation Truly elastic foundation	-
68	Upward soil pressure	q	$\frac{W_1 + W_2}{\frac{(B_1 + B_2)\, L}{2}}$	- KN/m^2
69	Types of foundation	-	1) Shallow foundation 2) Deep foundation	-
70	Combined footing types	-	1) Rectangular footing 2) Trapezoidal footing	-
71	Selection of types of foundation	-	Depth of the foundation Cost of foundation Permissible settlement	-
72	Safe bearing capacity	q_s	$\frac{1}{F}\left[CN_C{+}\gamma D\left[N_Q - 1\right]\mathrm{RW2}0.5\gamma\mathrm{B}N_\gamma\mathrm{RW2}\right] + \gamma\mathrm{D}$	KN/m^2
73	Net allowable bearing pressure	q_p	$34.3\ (N - 3)\ \frac{B+0.3^2}{2B}\ R_{w2}R_d$	-
74	Immediate settlement	S_i	$q\ B\left[\frac{1 - \mu^2}{E_S}\right] I_W$	mm
75	Types of deep foundation	-	Pile foundation Pier foundation	-
UNIT - IV PILE FOUNDATION				
76	Batter pile	-	A pile driven in at an angle inclined to the vertical to provide higher resistance to lateral loads.	-
77	Combination end-bearing and friction pile	-	Combined end bearing resistance developed at the pile tip and frictional and/or adhesion resistance on the pile.	-
78	Downdrag force	-	Forces induced foundations downward movement of adjacent soil relative to the foundation element.	-
79	End-bearing pile	-	A pile, the support the resistance of the foundation material on which the pile tip rests.	-
80	Engineering News Formula	Q_{safe}	$WH\eta h/\ (6(S+c))$	-
81	Efficiency of a pile	-	Ratio of the average ultimate load in the group to the individual ultimate load on the given pile.	-
82	Friction pile	-	Soil friction and/or adhesion mobilized along the side of the embedded pile.	-

83	Hiley's Formula	Q_u	$(WH\eta / (S + c)) * (1 + c_r^2 R) / (1+R))$	-
84	Types of deep foundation	-	Pile foundation Pier foundation	-
85	Pile Load Test	-	The most reliable method for determining the load carrying capacity of a pile is the pile load test.	-
86	Pier	-	Piers are often of large enough diameter to enable down-hole inspection.	-
87	Piles	-	Piles are usually constructed of timber, steel or pre-stressed reinforced concrete.	-
88	Pile caps	-	Pile caps are thick slabs used to tie a group of piles together to support and transmit column loads.	-
89	Under - Reamed Piles.	-	The base of an underreamed pile is increased by underreaming and providing a bulb the enlarged base.	-
90	Cast –in- site piles	-	Cased cast –in – situ concrete piles Uncased cast- in- situ concrete piles	-
91	Uncased cast-in-site concrete piles	-	Cheaper than cased cast-in-situ piles No need of special handling equipments	-
92	Efficiency of pile group	η_g	$\frac{Q_g}{nQ_u}$	-
93	Selection of pile	-	Character of structure Availability of materials Availability of funds	-
94	Single acting hammer	Q_a	$\frac{WH}{6(S + 0.25)}$	-
95	Double acting hammer	Q_a	$\frac{(W + ap)}{6(s + 0.25)}$	-
96	Ultimate capacity of pile/ Heiley's formula	Q_u	$\frac{n_h\ n_b\ WH}{S + C/2}$	kN
97	Factor of safety	F	$\frac{(ultimate\ pile\ load - negative\ skin\ friction\ force)}{working\ load}$	-
98	The efficiency of a pile group upon	-	Method of installation Spacing of piles Dimension of the pile	-

99	Converse labored formula	η_g	$1-\left[\frac{\theta}{90}\right]\left[\frac{(n-1)m+(m-1)n}{mn}\right]$	-
100	Saturated unit weight of soil	γ_{sat}	$\gamma_w \left[\frac{G_S + e_0}{1 + e_0}\right]$	KN/m^3
UNIT - V RETAINING WALLS				
101	At Rest Earth Pressure (*Ko*)	-	The horizontal stress developed in a mass of soil loaded in conditions of zero horizontal strain.	-
102	Active Earth Pressure (*Ka*)	-	The horizontal stress exerted by a mass of soil on a retaining wall as the wall moves away from the soil.	-
103	Active Zone	-	The area behind a retaining structure that is above the failure plane.	-
104	Buttress Fill	-	A buttress is generally specified by minimum key width and depth and by maximum back cut angle.	-
105	Coulomb Earth Pressure Theory	-	An earth pressure theory that includes friction between the soil and retaining structure.	-
106	Coulomb's Equation	-	An equation relating the shear strength of soil to the normal effective stress on the failure plane.	-
107	Counter fort Walls	-	Retaining wall that depends on tension ribs between the stem and the heel to resist flexure and overturning.	-
108	Coulomb's Wedge Theory	α	Sliding wedge which gets turn off from the rest of the back fill due to movement of the wall.	-
109	Earth Pressure	β	The force per unit area exerted by soil on a retaining wall.	-
110	Earth Pressure Coefficients	-	Coefficients used in determining earth pressure.	-
111	Gravity Walls	-	Retaining walls which depend upon their self weight to provide stability against overturning and sliding.	-
112	Key	-	A designed compacted fill placed in a trench excavated in earth material beneath the toe of a proposed fill slope	-
113	Keyway	-	An excavated trench into competent earth material beneath the toe of a proposed fill slope.	-
114	Passive Earth Pressure (*Kp*)	-	The maximum horizontal stress exerted by a mass of soil on a retaining surface moves toward the soil.	-

115	Plastic Equilibrium	Ca	The state of stress of a soil mass that has been loaded and deformed.	-
116	Rankine's Theory	C_{sl}	Earth pressure analysis that disregards friction between the wall and soil, and assumes that failure.	-
117	Retaining Walls	C_p	A wall designed to resist the lateral displacement of soil or other materials	-
118	Surcharge	P	An additional force applied at the exposed upper surface of a restrained soil.	-
119	Overturning	P_0	Overturning failure is a result of excessive lateral earth pressures with relation to retaining wall resistance.	-
120	Coefficient of passive earth pressure	K_P	$[1+\sin\phi/1-\sin\phi]$	-
121	Coefficient of active earth pressure	K_a	$\cos\beta\cos\beta\left[\frac{-\sqrt{\cos^2\beta-\cos^2\phi}}{\cos\beta+\sqrt{\cos^2\beta-\cos^2\phi}}\right]$	-
122	Coefficient of passive earth pressure	K_p	$\cos\beta\cos\beta\left[\frac{+\sqrt{\cos^2\beta-\cos^2\phi}}{\cos\beta-\sqrt{\cos^2\beta-\cos^2\phi}}\right]$	-
123	Pressure intensity of	P_a	$K_a\gamma H$	KN/m^2
124	Void Ratio	e	n/1-n	-
125	Coulomb wedge theory	-	Coulomb theory to analyse the earth pressure.	-

Subject		**General/Aptitude**		
S.No	**Term**	**Notation (Symbol)**	**Concept/Definition/ Meaning//Equation/ Expression**	**Units**
126	Terzaghi's bearing capacity factors Nc, Nq and Nr are functions of	-	Angle of internal friction only	-
127	The general relationship between specific gravity (G), weight of water ($\gamma\omega$), degree of saturation (S_r), void ratio (e) and bulk density (γ), is	-	$\gamma = (G + eS_r)\,\gamma\omega/(1 + e)$	-
128	'Loess' is silty clay formed by the action of	-	Wind	-

129	Rise of water table in cohesion-less soils upto ground surface reduces the net ultimate bearing capacity approximately by	-	50	%
130	In non-cohesive soil in passive state of plastic equilibrium	-	Minor principal stress is vertical	-
131	A soil has a bulk density of 22 kN/m^3 and water content 10 %. The dry density of soil is	-	20.0	kN/m^3
132	Through a point in a loaded soil, the principal stress is maximum on	-	Major principal plane	-
133	The expression $[G_s/(1 + \omega G_s)]\ \rho\omega$ is used for	-	Dry density	-
134	If the sand in-situ is in its densest state, then the relative density of sand is	-	1	-
135	If dry density, water density and specific gravity of solids of a given soil sample are 1.6 g/cc, 1.84 g/cc and 2.56 respectively, the porosity of the soil sample, is	-	0.375	-
136	The property of a soil which permits water to percolate through it, is called	-	Permeability	-
137	Toughness index is defined as the ratio of	-	Plasticity index to flow index	-
138	A moist soil sample of volume 60 cc. weighs 108 g and its dried weight is 86.4 g. If its absolute density is 2.52, the degree of saturation is	-	84	%
139	The hydraulic head that would produce a quick condition in a sand stratum of thickness 1.5 m, specific gravity 2.67 and voids ratio 0.67 is equal to	-	1.5	m
140	The maximum water content at which a reduction in water content does not cause a decrease in volume of a soil mass, is known	-	Shrinkage limit	-
141	In a consolidated drained test on a normally consolidated clay, the volume of the soil sample during shear	-	Decreases	-
142	The effective size of particles of soil is denoted by	-	D_{10}	-
143	Compressibility of sandy soils is	-	Much less than that of clayey soils	-
144	The maximum pressure which a soil can carry without shear failure, is called	-	Safe bearing capacity	-

145	A moist soil sample weighing 108 g has a volume of 60 cc. If water content is 25% and value of G = 2.52, the void ratio is	-	0.75	-
146	For a well-graded sand, the coefficient of curvature should be	-	Between 1 and 3	-
147	How many types of foundations are there based on depth?	-	2	-
148	CPRF stands for	-	Combined Pile Raft Foundation	-
149	Pier foundation is also called	-	Caisson	-
150	Machine foundation is subjected to	-	Static and dynamic loads	-

Signatures

HoD

Faculty Team Prepared

1. **Mrs.R.Selvapriya**