Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY , BANGALORE-90

COURSE PLAN

Academic Year 2019-20

Program:	B E – Civil Engineering
Semester :	5th
Course Code:	17CV53
Course Title:	APPLIED GEOTECHNICAL ENGINEERING
Credit / L-T-P:	4/ 4-0-0
Total Contact Hours:	50
Course Plan Author:	SHIVAPRASAD D G

Academic Evaluation and Monitoring Cell

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Note : Remove “Table of Content” before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	Civil Engineering	Program:	B.E
Semester:	5th	Academic Year:	2019-20
Course Title:	Appliied Geo-technical Engineering	Course Code:	17CV53
Credit / L-T-P:	4 / 4-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	50 Hours	SEE Marks:	60 Marks
CIA Marks:	40 Marks	Assignment	1 / Module
Course Plan Author:	SHIVAPRASAD D G	Sign ..	Dt:
Checked By:	MOHAN K T	Sign ..	Dt:
CO Targets	CIA Target : 85%	SEE Target:	80 %

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Content	Teaching Hours	Identified Module Concepts	Blooms Learning Levels
1	Objectives and Importance, Stages and Methods of exploration- Test pits, Borings, Geophysical methods, stabilization of boreholes, Sampling techniques, Undisturbed, disturbed and representative samples, Geophysical exploration and Bore hole log. Drainage and Dewatering methods estimation of depth of GWT (Hvorslev's method).	10	Characterisation of soil	L3
2	Introduction, Boussinesq's and Westergaard's theory - concentrated load, circular and rectangular load, equivalent point load method, pressure distribution diagrams and contact pressure, Newmark's chart. Foundation Settlement - Approximate method for stress distribution on a horizontal plane, Types of settlements and importance, Computation of immediate and consolidation settlement.	10	Analysis of stress in soil Analysis of foundation settlement	L4
3	Active, Passive and earth pressure at rest, Rankine's theory for cohesionless and cohesive soils, Coulomb's theory, Rebhann's and Culmann's graphical construction. Assumptions, infinite and finite slopes, factor of safety, use of Taylor's stability charts, Swedish slip circle method for C and C-ϕ (Method of slices) soils, Fellineous method for critical slip circle	10	Analysis of pressure in soil Stability analysis	L4
4	Types of foundations, determination of bearing capacity by Terzaghi's and BIS method (IS: 6403), Effect of water table and eccentricity, field methods - plate load test and SPT. Proportioning of shallow foundations- isolated and combined footings (only two columns)	10	Computation of bearing capacity	L4
5	Types of foundations, determination of bearing capacity by Terzaghi's and BIS method (IS: 6403), Effect of water table and eccentricity, field methods - plate load test and SPT. Proportioning of shallow foundations- isolated and combined footings (only two columns)	10	Strengthening of pile foundation	L4
-	**Total**		-	-

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).
1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modules	Details	Chapters in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
	Punmia B C, soil mechanics and Foundation Engineering, Laxmi publications co., New Delhi	In Library	
	Dr. K. R. Arora,Soil Mechanics and Foundation Engineering	In Library	
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
	Shashi K. Gulathi & Manoj Datta, Geo-technical Engineering-Phi Learning -,Tata McGraw Hill publications	In department	
	Prof. T.N. Ramamurthy and Prof. T.G. Sitharam, Geotechnical Engineering	In department	
C	**Concept Videos or Simulation for Understanding**	**-**	**-**
	NPTEL	VTU Website	
	Diginotes.vtu.ac.in	VTU Website	
D	**Software Tools for Design**	**-**	**-**
E	**Recent Developments for Research**	**-**	**-**
F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Modules	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level
1	15CV45	Basic Geotechnical Engineering	1. Knowledge on Index properties and Engineering properties of soil	4		L2

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-						

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modules	Topic / Description	Area	Remarks	Blooms Level
1				
3				
3				
5				
-				
-				

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Modules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	17CV53.1	Students are able to find the properties of soil by exploration of soil for construction of structures	10	Soil characterisation	Lecture	C.I.A	L3 Apply
2	.2	Students are able to analyse the distribution of stress in soil under loading	05	Analysis of stress in soil	Lecture	C.I.A	L4 Analyse
2	.3	Students are able to analyse the settlement of foundation under loading in cohesive and cohesion-less soil	05	Analysis of foundation settlement	Lecture	C.I.A	L4 Analyse
3	CO4	Students are able to analyse lateral earth pressure in soil at rest	05	Analysis of pressure in soil	Lecture	C.I.A	L4 Analyse
3	CO5	Students are able to analyse the factor of safety against failure of earth slope	05	Stability analysis	Lecture	C.I.A	L4 Analyse
4	CO6	Students are able to evaluate bearing capacity of shallow foundation by Terzaghis and B.I.S method	10	Computation of bearing capacity	Lecture	C.I.A	L5 Evaluate
5	CO7	Students are able to analyse the capacity and efficiency of single and group of piles in cohesive and cohesion-less soil	10	Strengthening of pile foundation	Lecture	C.I.A	L4 Analyse
					Lecture	Assignment	

-	-	Total	50	-	-	-	L2-L4

2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level
1	Ability to plan and execute geo-technical site investigation program for different civil engineering projects	CO1	L3
2	Ability to draw stress disribution digram for a given load on soil	CO2	L4
3	Ability measure settlement beneath loaded footings on sand and clayey soil	CO3	L4
4	Compute lateral earth pressure distribution behind earth retaining structures	CO4	L4
5	Ability to estimate factor of safety against failure of earth slopes	CO5	L4
6	Ability to determine bearing capacity of soil and achieve profiency in proportioning shallow isolated and combined footings for uniform bearing pressure	CO6	L5
7	Capability of estimating load carrying capacity of single and group of piles	CO7	L4

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.
To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Modules	Mapping		Mapping Level	Justification for each CO-PO pair	Level
-	**CO**	**PO**	-	**'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'**	-
	CO1	PO1		The students should be able to apply the fundamentals of engineering geology, earth sciences and soil mechanics to conduct subsoil investigations	L3
	CO1	PO4		The students should able to determine the bore hole spacing and analyse the subsoil investigation data to choose appropriate foundations for the structure	L3
	CO2	PO1		The students should apply the fundamentals of soil mechanics to solve complex geotechnical problems involving stresses under loaded areas.	L4
	CO3	PO1		The students should apply the fundamentals of soil mechanics to solve complex geotechnical problems involving foundation settlement	L4
	CO3	PO2		The students able to analyse the type of foundation settlement	L4
	CO4	PO1		The students should apply the fundamentals of soil mechanics to solve complex geotechnical problems involving active and passive earth pressures	L4
	CO5	PO1		Students have the engineering knowledge on earth slopes	L4
	CO5	PO2		Stability anaysis by using graphical methods	L4
	CO6	PO1		The students should apply the fundamentals of soil mechanics and mathematics to compute the bearing capacity of soil and solve problems related to settlement	L4
	CO6	PO2		The students should analyse the bearing capacity of soil to arrive at a choice of foundation or to choose necessary ground improvement techniques	L4
	CO6	PO3		The students should apply the fundamentals of foundation engineering to design isolated and combined footings	L4
	CO7	PO1		The students should be able to apply the fundamental of foundation engineering to solve complex problems related to pile foundations.	L5
				.	

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes														-
Modules	CO.#	**At the end of the course student should be able to . . .**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
	17CV53.1	Students are able to find the properties of soil by exploration of soil for construction of structures	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	L3
	17CV53.2	Students are able to analyse the distribution of stress in soil under loading	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L4
	17CV53.3	Students are able to analyse the settlement of foundation under loading in cohesive and cohesion-less soil	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	L4
	17CV53.4	Students are able to analyse lateral earth pressure in soil	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L4
	17CV53.5	Students are able to analyse the factor of safety against failure of earth slope	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	L4
	17CV53.6	Students are able to evaluate bearing capacity of shallow foundation by Terzaghis and B.I.S method	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	L4
	17CV53.7	Students are able to analyse the capacity and efficiency of single and group of piles in cohesive and cohesion-less soil	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L5
	17CV53PC.	Average	**2.42**	**1.28**	**0.42**	**0.42**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-	-
-		**Average attainment (1, 2, or 3)**																
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*															

5. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Modules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					

6. Content Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Modules	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1						

1						
2						
2						
3						
3						
4						
4						
5						
5						

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Modules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Soil exploration	10	2	-	-	1	1	2	CO1	L3
2	Stress in soils	10	2	-	-	1	1	2	CO2, CO3	L4,l4
3	Lateral earth pressure	10	-	2	-	1	1	2	CO4, CO5	L4,l4
4	Bearing capacity of shallow foundation	10	-	2	-	1	1	2	CO6	L4
5	Pile foundation	10	-	-	4	1	1	2	CO7	L5
-	**Total**	**50**	**4**	**4**	**4**	**5**	**5**	**10**	**-**	**-**

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modules	Evaluation	Weightage in Marks	CO	Levels
	CIA Exam – 1	15	CO1,CO2,CO3	L3,L4,L4
	CIA Exam – 2	15	CO4,CO5, CO6,	L4,L4,L4
	CIA Exam – 3	15	CO7	L5
	Assignment - 1	05	CO1,CO2,CO3	L3,L4,L4
	Assignment - 2	05	CO4,CO5, CO6,	L4,L4,L4
	Assignment - 3	05	CO7	L5
	Seminar - 1			
	Seminar - 2			
	Seminar - 3			
	Other Activities – define – Slip test		CO1 to Co7	L2, L3, L4 . ..
	Other Activities – Mini Project	-	CO9, CO10	L2,L2
	Final CIA Marks	**20**	**-**	**-**

D1. TEACHING PLAN - 1

Module - 1

Title:	Soil Exploration	Appr Time:	10 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Students are able to find the properties of soil by exploration of soil for construction of structures	CO1	L3
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	Introduction,Objectives and Importance	CO1	L2
2	Stages and Methods of exploration- Test pits, Borings, Geophysical methods	CO1	L2
3	stabilization of boreholes	CO1	L2
4	Sampling techniques	CO1	L2
5	Undisturbed, disturbed and representative samples	CO1	L2
6	Geophysical exploration and Bore hole log	CO1	L2
7	Drainage methods	CO1	L2
8	Dewatering methods	CO1	L2
9	estimation of depth of GWT (Hvorslev's method).	CO1	L3
10	estimation of depth of GWT (Hvorslev's method).	CO1	L3
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Use to find soil properties	CO1	L2
2	Used to determine the depth of ground water table	CO1	L3
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	List and explain various types of samplers	CO1	L2
2	Explain seismic refraction method of soil exploration with neat sketch	CO1	L2
3	What are the objectives of subsurface exploration?	CO1	L2
4	Describe with neat sketch wash boring technique to explore the soil?	CO1	L2
5	Explain with neat sketch electrical resistivity method of soil exploration?	CO1	L2
6	List out the methods of dewatering. Explain any two method of dewatering with neat sketch	CO1	L2
7	Indicate with neat sketches, selection of number and depth of boring for various civil engineering projects?	CO1	L2
8	List the methods used for controlling ground water during excavation and explain the electro — osmosis method.	CO1	L2
9	Estimate the ground water level by Hvorslev's method using the data given. Depth up to which water is bailed out is 30m, rise in water level after first day is 2.2m, second day 1.8m and on third day it is 1.5m.	CO1	L3
10	A sampling tube has inner diameter of 70mm and cutting edge of 68mm. its outside diameters are 72 mm and 74mm respectively. Determine area ratio, inside clearance, outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 580mm with length of sample recorded being 520mm. find the recovery ratio.	CO1	L3
e	**Experiences**	-	-
1			
2			
3			
4			

5			

Module – 2

Title:	Stress in Soils	Appr Time:	7 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Students are able to analyse the distribution of stress in soil under loading	CO3	L4
2	Students are able to analyse the settlement of foundation under loading in cohesive and cohesion-less soil	CO4	L3
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
11.	Stress in soil Introduction	CO2	L2
12.	Boussinesq's and Westergaard's theory - concentrated load, circular load	CO2	L2
13.	rectangular load, equivalent point load method	CO2	L2
14.	pressure distribution diagrams and contact pressure	CO2	L3
15.	Newmark's chart.	CO3	L2
16.	Foundation Settlement	CO3	L2
17.	Approximate method for stress distribution on a horizontal plane	CO3	L3
18.	Types of settlements and importance	CO3	L2
19.	Computation of immediate and consolidation settlement	CO3	L4
20.	Computation of immediate and consolidation settlement	CO3	L4
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
	Ability to draw stress disribution digram for a given load on soil	CO2	L3
	Ability measure settlement beneath loaded footings on sand and clayey soil	CO3	L4
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Explain with sketches various types of settlements. Comment on the sustainability of these types of settlements and functional utility of the structure	CO2	L2
2	List the components of settlement. Give expressions to calculate each one of them, clearly specifying what the notations stand for.	CO2	L2
3	Explain the basis of construction of Newmark's chart and discuss how it is used.	CO2	L2
4	Define isobar. Construct an isobar for a vertical stress of 40kN/m2 when ground surface is subjected to a concentrated load of 1000kN.	CO2	L1,L3
5	A circular area on the ground surface 6m in diameter carries a uniformly distributed load of 150kN/m2 . Calculate the vertical stress at depths of 3m, 6m, 9m and 12m. Also plot the variation of stress with depth.	CO2	L3
6	Derive an expression for vertical pressure under a uniformly loaded circular area along vertical symmetrical axis.	CO2	L2
7	Explain a 2V:1H approximate method to determine stress at a depth Z below the footing of rectangular shape of size B x L.	CO2	L2
8	A structure is supported by ring foundation of outer inner diameters 8m and 5m respectively. If the foundation transmits contact pressure of 200kN/m2, compute the stress 3m below the center of the foundation.	CO3	L3
9	A footing of rectangular shape 6m x 8m is uniformly loaded with 180kN/m2 at the ground level. Newmark's chart of influence factor 0.004 is used to find the stress at a certain depth. It that found that 24 elements of the chart are	CO3	L3

	covered by the loaded area. Determine the stress.		
10	A soft clay layer is 5m thick and lies under newly constructed building. The effective pressure due to overlying strata is 300kN/m and new construction increased the overburden by 120kN/m.If liquid limit is 80%, natural water content of the clay layer is 43% and G=2.70. Dry density of the clay is 18kN/m3.Compute the settlement.	CO3	L3,L4
e	**Experiences**	-	-
1			
2			
3			
4			
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	17CV53	Sem:	VII	Marks:	30	Time:	75 minutes
Course:	APPLIED GEOTECHNICAL ENGINEERING						

-	-	**Note: Answer all questions, each carry equal marks. Module : 1, 2**	**Marks**	**CO**	**Level**
1	a	List and explain various types of samplers	CO1	L2	07
	b	A sampling tube has inner diameter of 70mm and cutting edge of 68mm. its outside diameters are 72 mm and 74mm respectively. Determine area ratio, inside clearance, outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a d istance of 580mm with length of sample recorded being 520mm. find the recovery ratio.	CO1	L3	08
2	a	Explain seismic refraction method of soil exploration with neat sketch	CO1	L2	07
	b	Estimate the ground water level by Hvorslev's method using the data given. Depth up to which water is bailed out is 30m, rise in water level after first day is 2.2m, second day 1.8m and on third day it is 1.5m.	CO1	L3	08
3	a	Explain the basis of construction of Newmark's chart and discuss how it is used.	CO2	L2,L4	07
	b	A footing of rectangular shape 6m x 8m is uniformly loaded with 180kN/m2 at the ground level. Newmark's chart of influence factor 0.004 is used to find the stress at a certain depth. It that found that 24 elements of the chart are covered by the loaded area. Determine the stress.	CO2	L4	08
4	a	Explain with sketches various types of settlements. Comment on the sustainability of these types of settlements and functional utility of the structure	CO3	L2	07
	b	A soft clay layer is 5m thick and lies under newly constructed building. The effective pressure due to overlying strata is 300kN/m and new construction increased the overburden by 120kN/m.If liquid limit is 80%, natural water content of the clay layer is 43% and G=2.70. Dry density of the clay is 18kN/m3.Compute the settlement.	CO3	L3	08

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	17CV53	Sem:	VII	Marks:	5	Time:	90 – 120 minutes
Course:	APPLIED GEOTECHNICAL ENGINEERING			Module : 1, 2			
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	**USN**	**Assignment Description**	**Marks**	**CO**	**Level**
1	1KT15CV053	List and explain various types of samplers	5	CO1	L2
2	1KT16CV035	Explain seismic refraction method of soil exploration with neat	5	CO1	L2

		sketch			
3	1KT16CV020	What are the objectives of subsurface exploration?	5	CO1	L2
4	1KT16CV026	Describe with neat sketch wash boring technique to explore the soil?	5	CO1	L2
5	1KT16CV028	Explain with neat sketch electrical resistivity method of soil exploration?	5	CO1	L2
6	1KT16CV038	List out the methods of dewatering. Explain any two method of dewatering with neat sketch	5	CO1	L2
7	1KT16CV039	Indicate with neat sketches, selection of number and depth of boring for various civil engineering projects?	5	CO1	L2
8	1KT16CV042	List the methods used for controlling ground water during excavation and explain the electro — osmosis method.	5	CO1	L2
9	1KT16CV047	Estimate the ground water level by Hvorslev's method using the data given. Depth up to which water is bailed out is 30m, rise in water level after first day is 2.2m, second day 1.8m and on third day it is 1.5m.	5	CO1	L2
10	1KT16CV048	A sampling tube has inner diameter of 70mm and cutting edge of 68mm. its outside diameters are 72 mm and 74mm respectively. Determine area ratio, inside clearance, outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 580mm with length of sample recorded being 520mm. find the recovery ratio.	5	CO1	L4
11	1KT17CV007	Explain with sketches various types of settlements. Comment on the sustainability of these types of settlements and functional utility of the structure	5	CO2	L2
12	1KT17CV008	List the components of settlement. Give expressions to calculate each one of them, clearly specifying what the notations stand for.	5	CO2	L2
13	1KT17CV010	Explain the basis of construction of Newmark's chart and discuss how it is used.	5	CO2	L2
14	1KT17CV012	Define isobar. Construct an isobar for a vertical stress of 40kN/m2 when ground surface is subjected to a concentrated load of 1000kN.	5	CO2	L1,L3
15	1KT17CV011	A circular area on the ground surface 6m in diameter carries a uniformly distributed load of 150kN/m2 . Calculate the vertical stress at depths of 3m, 6m, 9m and 12m. Also plot the variation of stress with depth.	5	CO2	L3
16	1KT17CV013	Derive an expression for vertical pressure under a uniformly loaded circular area along vertical symmetrical axis.	5	CO2	L2
17	1KT17CV015	Explain a 2V:1H approximate method to determine stress at a depth Z below the footing of rectangular shape of size B x L.	5	CO2	L2
18	1KT17CV017	A structure is supported by ring foundation of outer inner diameters 8m and 5m respectively. If the foundation transmits contact pressure of 200kN/m2, compute the stress 3m below the center of the foundation.	5	CO3	L3
19	1KT17CV019	A footing of rectangular shape 6m x 8m is uniformly loaded with 180kN/m2 at the ground level. Newmark's chart of influence factor 0.004 is used to find the stress at a certain depth. It that found that 24 elements of the chart are covered by the loaded area. Determine the stress.	5	CO3	L3
20	1KT17CV020	A soft clay layer is 5m thick and lies under newly constructed building. The effective pressure due to overlying strata is 300kN/m and new construction increased the overburden by 120kN/m.If liquid limit is 80%, natural water content of the clay layer is 43% and G=2.70. Dry density of the clay is	5	CO3	L3,L4

		18kN/m3.Compute the settlement.			
21	1KT17CV021	List and explain various types of samplers	5	CO1	L2
22	1KT17CV023	Explain seismic refraction method of soil exploration with neat sketch	5	CO1	L2
23	1KT17CV024	What are the objectives of subsurface exploration?	5	CO1	L2
24	1KT17CV025	Describe with neat sketch wash boring technique to explore the soil?	5	CO1	L2
25	1KT17CV026	Explain with neat sketch electrical resistivity method of soil exploration?	5	CO1	L2
26	1KT18CV400	List out the methods of dewatering. Explain any two method of dewatering with neat sketch	5	CO1	L2
27	1KT18CV421	Indicate with neat sketches, selection of number and depth of boring for various civil engineering projects?	5	CO1	L2
28	1KT18CV401	List the methods used for controlling ground water during excavation and explain the electro — osmosis method.	5	CO1	L2
29	1KT18CV402	Estimate the ground water level by Hvorslev's method using the data given. Depth up to which water is bailed out is 30m, rise in water level after first day is 2.2m, second day 1.8m and on third day it is 1.5m.	5	CO1	L2
30	1KT18CV403	A sampling tube has inner diameter of 70mm and cutting edge of 68mm. its outside diameters are 72 mm and 74mm respectively. Determine area ratio, inside clearance, outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 580mm with length of sample recorded being 520mm. find the recovery ratio.	5	CO1	L4
31	1KT18CV422	Explain with sketches various types of settlements. Comment on the sustainability of these types of settlements and functional utility of the structure	5	CO2	L2
32	1KT18CV404	List the components of settlement. Give expressions to calculate each one of them, clearly specifying what the notations stand for.	5	CO2	L2
33	1KT17CV412	Explain the basis of construction of Newmark's chart and discuss how it is used.	5	CO2	L2
34	1KT18CV406	Define isobar. Construct an isobar for a vertical stress of 40kN/m2 when ground surface is subjected to a concentrated load of 1000kN.	5	CO2	L1,L3
35	1KT18CV405	A circular area on the ground surface 6m in diameter carries a uniformly distributed load of 150kN/m2 . Calculate the vertical stress at depths of 3m, 6m, 9m and 12m. Also plot the variation of stress with depth.	5	CO2	L3
36	1KT18CV407	Derive an expression for vertical pressure under a uniformly loaded circular area along vertical symmetrical axis.	5	CO2	L2
37	1KT18CV408	Explain a 2V:1H approximate method to determine stress at a depth Z below the footing of rectangular shape of size B x L.	5	CO2	L2
38	1KT18CV409	A structure is supported by ring foundation of outer inner diameters 8m and 5m respectively. If the foundation transmits contact pressure of 200kN/m2, compute the stress 3m below the center of the foundation.	5	CO3	L3
39	1KT16CV055	A footing of rectangular shape 6m x 8m is uniformly loaded with 180kN/m2 at the ground level. Newmark's chart of influence factor 0.004 is used to find the stress at a certain depth. It that found that 24 elements of the chart are covered by the loaded area. Determine the stress.	5	CO3	L3
40	1KT16CV060	A soft clay layer is 5m thick and lies under newly constructed	5	CO3	L3,L4

		building. The effective pressure due to overlying strata is 300kN/m and new construction increased the overburden by 120kN/m.If liquid limit is 80%, natural water content of the clay layer is 43% and G=2.70. Dry density of the clay is 18kN/m3.Compute the settlement.			
41	1KT16CV077	List and explain various types of samplers	5	CO1	L2
42	1KT16CV082	Explain seismic refraction method of soil exploration with neat sketch	5	CO1	L2
43	1KT16CV088	What are the objectives of subsurface exploration?	5	CO1	L2
44	1KT16CV094	Describe with neat sketch wash boring technique to explore the soil?	5	CO1	L2
45	1KT16CV098	Explain with neat sketch electrical resistivity method of soil exploration?	5	CO1	L2
46	1KT16CV102	List out the methods of dewatering. Explain any two method of dewatering with neat sketch	5	CO1	L2
47	1KT17CV028	Indicate with neat sketches, selection of number and depth of boring for various civil engineering projects?	5	CO1	L2
48	1KT17CV029	List the methods used for controlling ground water during excavation and explain the electro — osmosis method.	5	CO1	L2
49	1KT17CV031	Estimate the ground water level by Hvorslev's method using the data given. Depth up to which water is bailed out is 30m, rise in water level after first day is 2.2m, second day 1.8m and on third day it is 1.5m.	5	CO1	L2
50	1KT17CV032	A sampling tube has inner diameter of 70mm and cutting edge of 68mm. its outside diameters are 72 mm and 74mm respectively. Determine area ratio, inside clearance, outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 580mm with length of sample recorded being 520mm. find the recovery ratio.	5	CO1	L4
51	1KT17CV033	Explain with sketches various types of settlements. Comment on the sustainability of these types of settlements and functional utility of the structure	5	CO2	L2
52	1KT17CV034	List the components of settlement. Give expressions to calculate each one of them, clearly specifying what the notations stand for.	5	CO2	L2
53	1KT17CV035	Explain the basis of construction of Newmark's chart and discuss how it is used.	5	CO2	L2
54	1KT17CV036	Define isobar. Construct an isobar for a vertical stress of 40kN/m2 when ground surface is subjected to a concentrated load of 1000kN.	5	CO2	L1,L3
55	1KT17CV037	A circular area on the ground surface 6m in diameter carries a uniformly distributed load of 150kN/m2 . Calculate the vertical stress at depths of 3m, 6m, 9m and 12m. Also plot the variation of stress with depth.	5	CO2	L3
56	1KT17CV038	Derive an expression for vertical pressure under a uniformly loaded circular area along vertical symmetrical axis.	5	CO2	L2
57	1KT17CV040	Explain a 2V:1H approximate method to determine stress at a depth Z below the footing of rectangular shape of size B x L.	5	CO2	L2
58	1KT17CV041	A structure is supported by ring foundation of outer inner diameters 8m and 5m respectively. If the foundation transmits contact pressure of 200kN/m2, compute the stress 3m below the center of the foundation.	5	CO3	L3
59	1KT17CV042	A footing of rectangular shape 6m x 8m is uniformly loaded with 180kN/m2 at the ground level. Newmark's chart of influence factor 0.004 is used to find the stress at a certain	5	CO3	L3

		depth. It that found that 24 elements of the chart are covered by the loaded area. Determine the stress.			
60	1KT17CV050	A soft clay layer is 5m thick and lies under newly constructed building. The effective pressure due to overlying strata is 300kN/m and new construction increased the overburden by 120kN/m.If liquid limit is 80%, natural water content of the clay layer is 43% and G=2.70. Dry density of the clay is 18kN/m3.Compute the settlement.	5	CO3	L3,L4
61	1KT17CV053	List and explain various types of samplers	5	CO1	L2
62	1KT17CV055	Explain seismic refraction method of soil exploration with neat sketch	5	CO1	L2
63	1KT18CV423	What are the objectives of subsurface exploration?	5	CO1	L2
64	1KT18CV412	Describe with neat sketch wash boring technique to explore the soil?	5	CO1	L2
65	1KT18CV424	Explain with neat sketch electrical resistivity method of soil exploration?	5	CO1	L2
66	1KT18CV415	List out the methods of dewatering. Explain any two method of dewatering with neat sketch	5	CO1	L2
67	1KT18CV414	Indicate with neat sketches, selection of number and depth of boring for various civil engineering projects?	5	CO1	L2
68	1KT18CV416	List the methods used for controlling ground water during excavation and explain the electro — osmosis method.	5	CO1	L2
69	1KT18CV417	Estimate the ground water level by Hvorslev's method using the data given. Depth up to which water is bailed out is 30m, rise in water level after first day is 2.2m, second day 1.8m and on third day it is 1.5m.	5	CO1	L2
70	1KT18CV418	A sampling tube has inner diameter of 70mm and cutting edge of 68mm. its outside diameters are 72 mm and 74mm respectively. Determine area ratio, inside clearance, outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 580mm with length of sample recorded being 520mm. find the recovery ratio.	5	CO1	L4
71	1KT18CV419	Explain with sketches various types of settlements. Comment on the sustainability of these types of settlements and functional utility of the structure	5	CO2	L2
72	1KT18CV411	List the components of settlement. Give expressions to calculate each one of them, clearly specifying what the notations stand for.	5	CO2	L2
73	1KT18CV410	Explain the basis of construction of Newmark's chart and discuss how it is used.	5	CO2	L2
74	1KT18CV413	Define isobar. Construct an isobar for a vertical stress of 40kN/m2 when ground surface is subjected to a concentrated load of 1000kN.	5	CO2	L1,L3
75	1KT18CV420	A circular area on the ground surface 6m in diameter carries a uniformly distributed load of 150kN/m2 . Calculate the vertical stress at depths of 3m, 6m, 9m and 12m. Also plot the variation of stress with depth.	5	CO2	L3
76	1KT18CV425	Derive an expression for vertical pressure under a uniformly loaded circular area along vertical symmetrical axis.	5	CO2	L2

D2. TEACHING PLAN - 2

Module – 3

Title:	Lateral Earth Pressure & Stability of Slopes	Appr	12 Hrs

		Time:	
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Analyse lateral earth pressure in soil at rest	CO4	L4
2	Analyse the factor of safety against failure of earth slope	CO5	L5
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
1	Active, Passive and earth pressure at rest	C04	L2
2	Rankine's theory for cohesionless soil	C04	L2
3	Rankine's theory for cohesive soil	C04	L2
4	Coulomb's theory	C04	L2
5	Rebhann's and Culmann's graphical construction.	C04	L3,L4
6	Assumptions,	C05	L2
7	infinite and finite slopes, factor of safety	C05	L2
8	use of Taylor's stability charts	C05	L2
9	Swedish slip circle method for C and C-ϕ (Method of slices) soils	C05	L3,L4
10	Fellineous method for critical slip circle	C05	L3,L4
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Compute lateral earth pressure distribution behind earth retaining structures	CO4	L4
2	Ability to estimate factor of safety against failure of earth slopes	CO5	L4
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Explain what is meant by active and passive states of plastic equilibrium with sketch.	CO4	L2
2	Derive an expression for factor of safety for infinite slope	CO4	L2
3	What are the causes of failure slopes	CO4	L2
4	Explain with neat sketches i) Active earth pressure ii) Passive earth pressure iii) earth pressure at rest.	CO4	L2
5	Explain Culmann's graphical method for finding out the active earth pressure.	CO5	L3
6	Define Rebhann's graphical method of finding active pressure on a retaining wall.	CO5	L5
7	what are the assumption and limitations of Rankine and coulomb's earth pressure theories.	CO4	L2
8	Mention the different types of slopes and explain the various causes of slope failure.	CO5	L2
9	Explain method of slice to determine the factor of safety against failure of finite slope.	CO5	L2
10	Derive the equation for finite and Infinite Slopes.	CO5	L2
e	**Experiences**	-	-
1			
2			
3			

4			
5			

Module – 4

Title:	Bearing Capacity of Shallow Foundation	Appr Time:	13 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Evaluate bearing capacity of shallow foundation by Terzaghis and B.I.S method		
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
1	Types of foundations	CO6	L2
2	determination of bearing capacity by Terzaghi's	CO6	L3
3	determination of bearing capacity by BIS method	CO6	L3
4	Effect of water table	CO6	L2
5	Effect of eccentricity	CO6	L2
6	field methods	CO6	L2
7	plate load test	CO6	L2
8	SPT	CO6	L2
9	Proportioning of shallow foundations- isolated	CO6	L5
10	Proportioning of shallow foundations- combined footings	CO6	L5
c	**Application Areas**	**-**	**-**
1	Ability to determine bearing capacity of soil and achieve profiency in proportioning shallow isolated and combined footings for uniform bearing pressure	CO6	L5
d	**Review Questions**	-	-
1	Define ultimate and safe bearing capacity of soil.	CO6	L2
2	Give the Terzaghi's equation for bearing capacity of strip, square, circular and rectangular footing.	CO6	L2
3	Discuss the effect of ground water table on bearing capacity.	CO6	L2
4	Explain plate load test with neat sketches to determine bearing capacity soils.	CO6	L2
5	List the assumptions made in terzaghi's bearing capacity theory.	CO6	L2
6	What is standard penetration test? Explain.	CO6	L2
7	What are the corrections applied to observed N values.	CO6	L2
8	Discuss the proportioning of combined footing.	CO6	L2
e	**Experiences**		
1			
2			
3			
4			
5			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	17CV53	Sem:	VII	Marks:	30	Time:	75 minutes		
Course:	APPLIED GEOTECHNICAL ENGINEERING								
-	**-**	**Note: Answer all questions, each carry equal marks. Module : 3, 4**					**Marks**	**CO**	**Level**
1	a	Explain what is meant by active and passive states of plastic equilibrium with sketch.					05	CO5	L2
	b	An embankment is made of soil having C=25kN/m and φ=20 and unit weight γ=19kN/m . The slope is 1.5H: 1V and has 9m height. Determine the factor of safety along a slip circle passing through toe. The center of slip circle is located at Fellinious angles α=26 0 and β=35 0 . Use method of slices and analyze.					10	CO5	L3,L4
2	a	Derive an expression for factor of safety for infinite slope					05	CO5	L2
	b	A retaining wall is 9.0m high , retains cohesion-less backfill. The top 3m of fill has unit weight γ=18kN/m 3 with φ= 32 0 . The rest has unit weight γ=22kN/m 3 with φ= 22 0 . Determine the active earth pressure on the wall and its position.					10	CO5	L3
3	a	Define i. Safe bearing capacity ii. Allowable bearing capacity					04	CO6	L2
	b	What will be the net safe bearing pressure of sand having φ =36 ^{0} , take effective unit weight of soil as 19kN/m ^{3} i. 1.2m wide strip footing ii. 1.2m wide square footing.					06	CO6	L3
	c	Write a note on how bearing capacity changes with respect to water table level.					05	CO6	L3
4	a	When there is need of combined footing, explain with sketches					05	CO6	L3
	b	Design a square footing to carry a safe load of 2400kN on a sandy soil at a depth of 1.5m below GL with factor of safety of 3. Given γ sat =21kN/m 3 with N c = 25, N q = 34 and N γ = 32. Permissible settlement is 40mm. water table may rise up to the base of the footing.					10	CO6	L4

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	17CV53	Sem:	VII	Marks:	5	Time:	90 – 120 minutes
Course:	APPLIED GEOTECHNICAL ENGINEERING			Module : 3, 4			
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1	1KT15CV053	Explain Culmann's graphical method for finding out the active earth pressure.	5	CO4	L2
2	1KT16CV035	Define Rebhann's graphical method of finding active pressure on a retaining wall.	5	CO4	L2
3	1KT16CV020	what are the assumption and limitations of Rankine and coulomb's earth pressure theories.5	5	CO4	L2
4	1KT16CV026	Mention the different types of slopes and explain the various causes of slope failure.	5	CO4	L2
5	1KT16CV028	Explain method of slice to determine the factor of safety against failure of finite slope.	5	CO5	L3
6	1KT16CV038	Derive the equation for finite and Infinite Slopes.	5	CO5	L5
7	1KT16CV039	Define ultimate and safe bearing capacity of soil.	5	CO4	L2
8	1KT16CV042	Give the Terzaghi's equation for bearing capacity of strip,	5	CO5	L2

		square, circular and rectangular footing.			
9	1KT16CV047	Discuss the effect of ground water table on bearing capacity.	5	CO5	L2
10	1KT16CV048	Explain plate load test with neat sketches to determine bearing capacity soils.	5	CO5	L2
11	1KT17CV007	List the assumptions made in terzaghi's bearing capacity theory.	5	CO6	L2
12	1KT17CV008	What is standard penetration test? Explain.	5	CO6	L2
13	1KT17CV010	What are the corrections applied to observed N values.	5	CO6	L2
14	1KT17CV012	Discuss the proportioning of combined footing.	5	CO6	L2
15	1KT17CV011	Write a note on standard penetration test and its corrections.	5	CO6	L2
16	1KT17CV013	Calculate the ultimate bearing capacity of a 2m wide square footing resting on the ground surface of a sand deposit with the following properties : i) Unit weight 18.6 KN/m3 ii) Angle of internal friction 35˚. Also calculate UBC of same footing when it is placed at depth of lm below the ground surface. Take Nq = 41.4 , N, = 42.2.	5	CO6	L4
17	1KT17CV015	Discuss effect of water table on bearing capacity of soil.	5	CO6	L2
18	1KT17CV017	A square footing placed at a depth of 1m is required to carry a load of 1000kN. Find the required size of footing given the following data : C = 10kN/m2 , $\emptyset$ = 38˚ , y = 19kN/m3. For $\emptyset$ = 38˚. Terzaghi's bearing capacity factors are N_c = 61.35 , N2 = 48.93 , N_y = 74.03. Assume water table is at base of footing.	5	CO6	L4
19	1KT17CV019	A circular footing rests on a pure clay with qu = 270 kN/m^2 at a depth of 1.8m. Determine the diameter of the footing if it has to transmit a load of 720 kN. Assume the bulk unit weight of soil as 181(N/m3 and the factor of safety as 3.	5	CO6	L4
20	1KT17CV020	Explain Culmann's graphical method for finding out the active earth pressure.	5	CO4	L2
21	1KT17CV021	Define Rebhann's graphical method of finding active pressure on a retaining wall.	5	CO4	L2
22	1KT17CV023	what are the assumption and limitations of Rankine and coulomb's earth pressure theories.	5	CO4	L2
23	1KT17CV024	Mention the different types of slopes and explain the various causes of slope failure.	5	CO4	L2
24	1KT17CV025	Explain method of slice to determine the factor of safety against failure of finite slope.	5	CO5	L3
25	1KT17CV026	Derive the equation for finite and Infinite Slopes.	5	CO5	L5
26	1KT18CV400	Define ultimate and safe bearing capacity of soil.	5	CO4	L2
27	1KT18CV421	Give the Terzaghi's equation for bearing capacity of strip, square, circular and rectangular footing.	5	CO5	L2
28	1KT18CV401	Discuss the effect of ground water table on bearing capacity.	5	CO5	L2
29	1KT18CV402	Explain plate load test with neat sketches to determine bearing capacity soils.	5	CO5	L2
30	1KT18CV403	List the assumptions made in terzaghi's bearing capacity theory.	5	CO6	L2
31	1KT18CV422	What is standard penetration test? Explain.	5	CO6	L2
32	1KT18CV404	What are the corrections applied to observed N values.	5	CO6	L2
33	1KT17CV412	Discuss the proportioning of combined footing.	5	CO6	L2
34	1KT18CV406	Write a note on standard penetration test and its corrections.	5	CO6	L2

35	1KT18CV405	Calculate the ultimate bearing capacity of a 2m wide square footing resting on the ground surface of a sand deposit with the following properties : i) Unit weight 18.6 KN/m3 ii) Angle of internal friction 35˚. Also calculate UBC of same footing when it is placed at depth of lm below the ground surface. Take Nq = 41.4 , N, = 42.2.	5	CO6	L4
36	1KT18CV407	Discuss effect of water table on bearing capacity of soil.	5	CO6	L2
37	1KT18CV408	A square footing placed at a depth of 1m is required to carry a load of 1000kN. Find the required size of footing given the following data : C = 10kN/m2 , Ø = 38˚ , y = 19kN/m3. For Ø = 38˚. Terzaghi's bearing capacity factors are N_c = 61.35 , N2 = 48.93 , N_y = 74.03. Assume water table is at base of footing.	5	CO6	L4
38	1KT18CV409	A circular footing rests on a pure clay with qu = 270 kN/m^2 at a depth of 1.8m. Determine the diameter of the footing if it has to transmit a load of 720 kN. Assume the bulk unit weight of soil as 181(N/m3 and the factor of safety as 3.	5	CO6	L4
39	1KT16CV055	Explain Culmann's graphical method for finding out the active earth pressure.	5	CO4	L2
40	1KT16CV060	Define Rebhann's graphical method of finding active pressure on a retaining wall.	5	CO4	L2
41	1KT16CV077	what are the assumption and limitations of Rankine and coulomb's earth pressure theories.	5	CO4	L2
42	1KT16CV082	Mention the different types of slopes and explain the various causes of slope failure.	5	CO4	L2
43	1KT16CV088	Explain method of slice to determine the factor of safety against failure of finite slope.	5	CO5	L3
44	1KT16CV094	Derive the equation for finite and Infinite Slopes.	5	CO5	L5
45	1KT16CV098	Define ultimate and safe bearing capacity of soil.	5	CO4	L2
46	1KT16CV102	Give the Terzaghi's equation for bearing capacity of strip, square, circular and rectangular footing.	5	CO5	L2
47	1KT17CV028	Discuss the effect of ground water table on bearing capacity.	5	CO5	L2
48	1KT17CV029	Explain plate load test with neat sketches to determine bearing capacity soils.	5	CO5	L2
49	1KT17CV031	List the assumptions made in terzaghi's bearing capacity theory.	5	CO6	L2
50	1KT17CV032	What is standard penetration test? Explain.	5	CO6	L2
51	1KT17CV033	What are the corrections applied to observed N values.	5	CO6	L2
52	1KT17CV034	Discuss the proportioning of combined footing.	5	CO6	L2
53	1KT17CV035	Write a note on standard penetration test and its corrections.	5	CO6	L2
54	1KT17CV036	Calculate the ultimate bearing capacity of a 2m wide square footing resting on the ground surface of a sand deposit with the following properties : i) Unit weight 18.6 KN/m3 ii) Angle of internal friction 35˚. Also calculate UBC of same footing when it is placed at depth of lm below the ground surface. Take Nq = 41.4 , N, = 42.2.	5	CO6	L4
55	1KT17CV037	Discuss effect of water table on bearing capacity of soil.	5	CO6	L2
56	1KT17CV038	A square footing placed at a depth of 1m is required to carry a	5	CO6	L4

		load of 1000kN. Find the required size of footing given the following data : C = 10kN/m2 , Ø = 38° , y = 19kN/m3. For Ø = 38°. Terzaghi's bearing capacity factors are N_c = 61.35 , N2 = 48.93 , N_y = 74.03. Assume water table is at base of footing.			
57	1KT17CV040	A circular footing rests on a pure clay with qu = 270 kN/m² at a depth of 1.8m. Determine the diameter of the footing if it has to transmit a load of 720 kN. Assume the bulk unit weight of soil as 181(N/m3 and the factor of safety as 3.	5	CO6	L4
58	1KT17CV041	Explain Culmann's graphical method for finding out the active earth pressure.	5	CO4	L2
59	1KT17CV042	Define Rebhann's graphical method of finding active pressure on a retaining wall.	5	CO4	L2
60	1KT17CV050	what are the assumption and limitations of Rankine and coulomb's earth pressure theories.	5	CO4	L2
61	1KT17CV053	Mention the different types of slopes and explain the various causes of slope failure.	5	CO4	L2
62	1KT17CV055	Explain method of slice to determine the factor of safety against failure of finite slope.	5	CO5	L3
63	1KT18CV423	Derive the equation for finite and Infinite Slopes.	5	CO5	L5
64	1KT18CV412	Define ultimate and safe bearing capacity of soil.	5	CO4	L2
65	1KT18CV424	Give the Terzaghi's equation for bearing capacity of strip, square, circular and rectangular footing.	5	CO5	L2
66	1KT18CV415	Discuss the effect of ground water table on bearing capacity.	5	CO5	L2
67	1KT18CV414	Explain plate load test with neat sketches to determine bearing capacity soils.	5	CO5	L2
68	1KT18CV416	List the assumptions made in terzaghi's bearing capacity theory.	5	CO6	L2
69	1KT18CV417	What is standard penetration test? Explain.	5	CO6	L2
70	1KT18CV418	What are the corrections applied to observed N values.	5	CO6	L2
71	1KT18CV419	Discuss the proportioning of combined footing.	5	CO6	L2
72	1KT18CV411	Write a note on standard penetration test and its corrections.	5	CO6	L2
73	1KT18CV410	Calculate the ultimate bearing capacity of a 2m wide square footing resting on the ground surface of a sand deposit with the following properties : i) Unit weight 18.6 KN/m3 ii) Angle of internal friction 35°. Also calculate UBC of same footing when it is placed at depth of lm below the ground surface. Take Nq = 41.4 , N, = 42.2.	5	CO6	L4
74	1KT18CV413	Discuss effect of water table on bearing capacity of soil.	5	CO6	L2
75	1KT18CV420	A square footing placed at a depth of 1m is required to carry a load of 1000kN. Find the required size of footing given the following data : C = 10kN/m2 , Ø = 38° , y = 19kN/m3. For Ø = 38°. Terzaghi's bearing capacity factors are N_c = 61.35 , N2 = 48.93 , N_y = 74.03. Assume water table is at base of footing.	5	CO6	L4
76	1KT18CV425	A circular footing rests on a pure clay with qu = 270 kN/m² at a depth of 1.8m. Determine the diameter of the footing if it has to transmit a load of 720 kN. Assume the bulk unit weight of soil as 181(N/m3 and the factor of safety as 3.	5	CO6	L4

D3. TEACHING PLAN - 3

Module – 5

Title:	Pile Foundation	Appr Time:	10 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Analyse the capacity and efficiency of single and group of piles in cohesive and cohesion-less soil		
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	Types and classification of piles	CO7	L2
2	single loaded pile capacity in cohesion-less soils by static formula	CO7	L2
3	single loaded pile capacity in cohesive soils by static formula	CO7	L2
4	efficiency of file group	CO7	L4
5	group capacity of piles in cohesion-less soils	CO7	L3
6	group capacity of piles in cohesive soils	CO7	L3
7	negative skin friction	CO7	L2
8	pile load tests	CO7	L2
9	Settlement of piles	CO7	L2
10	under reamed piles (only introductory concepts – no derivation)	CO7	L2
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
	Capability of estimating load carrying capacity of single and group of piles	CO7	L4
d	**Review Questions**	-	-
	The attainment of the module learning assessed through following questions	-	-
1	Classify the pile foundation and explain briefly.	CO7	L2
2	Explain Static formula for the design of piles.	CO7	L2
3	With a neat sketch, explain undereamed piles.	CO7	L2
4	With a neat sketch, Explain Pile load test.	CO7	L2
5	What is meant by Efficiency of piles. Explain felds rule.	CO7	L2
6	Explain Settlement of piles in cohesive and cohesionless soil.	CO7	L2
7	Write a note on classification of piles	CO7	L2
8	Explain negative skin friction in pile foundation	CO7	L2
9	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	CO7	L4
10	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	CO7	L4

11	Explain the factors influencing the selection of depth of foundation.	CO7	L4
12	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	CO7	L4
e	**Experiences**	-	-
1			
2			
3			
4			
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	17CV53	Sem:	VII	Marks:	30	Time:	75 minutes
Course:	APPLIED GEOTECHNICAL ENGINEERING						

-	-	**Note: Answer all questions, each carry equal marks. Module : 5**	**Marks**	**CO**	**Level**
1	a	Write a note on classification of piles	04	CO7	L2
	b	What is meant by efficiency of pile group, explain Feld's rule.	05	CO7	L2
	c	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	06	CO7	L4
2	a	Explain static formula for the design of piles	04	CO7	L2
	b	Draw a typical arrangement of under reamed pile with proportion of diameter of pile, bulb and spacing.	06	CO7	L2
	c	Write a note on pile load test	05	CO7	L2
3	a	Classify the various type of Piles based on material and function.	08	CO7	L2
	b	Explain negative skin friction in pile foundation	07	CO7	L2
4	a	Explain determination of the pile load capacity in detail.	07	CO7	L2
	b	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	08	CO7	L4

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	17CV53	Sem:	VII	Marks:	5	Time:	90 – 120 minutes
Course:	APPLIED GEOTECHNICAL ENGINEERING			Module : 5			
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	**USN**	**Assignment Description**	**Marks**	**CO**	**Level**
1	1KT15CV053	Classify the pile foundation and explain briefly.	5	CO7	L2
2	1KT16CV035	Explain Static formula for the design of piles.	5	CO7	L2
3	1KT16CV020	With a neat sketch, explain undereamed piles.	5	CO7	L2

4	1KT16CV026	With a neat sketch, Explain Pile load test.	5	CO7	L2
5	1KT16CV028	What is meant by Efficiency of piles. Explain felds rule.	5	CO7	L2
6	1KT16CV038	Explain Settlement of piles in cohesive and cohesionless soil.	5	CO7	L2
7	1KT16CV039	Write a note on classification of piles	5	CO7	L2
8	1KT16CV042	Explain negative skin friction in pile foundation	5	CO7	L2
9	1KT16CV047	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	5	CO7	L4
10	1KT16CV048	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
11	1KT17CV007	Explain the factors influencing the selection of depth of foundation.	5	CO7	L4
12	1KT17CV008	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
13	1KT17CV010	Classify the pile foundation and explain briefly.	5	CO7	L2
14	1KT17CV012	Explain Static formula for the design of piles.	5	CO7	L2
15	1KT17CV011	With a neat sketch, explain undereamed piles.	5	CO7	L2
16	1KT17CV013	With a neat sketch, Explain Pile load test.	5	CO7	L2
17	1KT17CV015	What is meant by Efficiency of piles. Explain felds rule.	5	CO7	L2
18	1KT17CV017	Explain Settlement of piles in cohesive and cohesionless soil.	5	CO7	L2
19	1KT17CV019	Write a note on classification of piles	5	CO7	L2
20	1KT17CV020	Explain negative skin friction in pile foundation	5	CO7	L2
21	1KT17CV021	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	5	CO7	L4
22	1KT17CV023	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
23	1KT17CV024	Explain the factors influencing the selection of depth of foundation.	5	CO7	L4
24	1KT17CV025	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile	5	CO7	L4

		group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.			
25	1KT17CV026	Classify the pile foundation and explain briefly.	5	CO7	L2
26	1KT18CV400	Explain Static formula for the design of piles.	5	CO7	L2
27	1KT18CV421	With a neat sketch, explain undereamed piles.	5	CO7	L2
28	1KT18CV401	With a neat sketch, Explain Pile load test.	5	CO7	L2
29	1KT18CV402	What is meant by Efficiency of piles. Explain felds rule.	5	CO7	L2
30	1KT18CV403	Explain Settlement of piles in cohesive and cohesionless soil.	5	CO7	L2
31	1KT18CV422	Write a note on classification of piles	5	CO7	L2
32	1KT18CV404	Explain negative skin friction in pile foundation	5	CO7	L2
33	1KT17CV412	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	5	CO7	L4
34	1KT18CV406	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
35	1KT18CV405	Explain the factors influencing the selection of depth of foundation.	5	CO7	L4
36	1KT18CV407	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
37	1KT18CV408	Classify the pile foundation and explain briefly.	5	CO7	L2
38	1KT18CV409	Explain Static formula for the design of piles.	5	CO7	L2
39	1KT16CV055	With a neat sketch, explain undereamed piles.	5	CO7	L2
40	1KT16CV060	With a neat sketch, Explain Pile load test.	5	CO7	L2
41	1KT16CV077	What is meant by Efficiency of piles. Explain felds rule.	5	CO7	L2
42	1KT16CV082	Explain Settlement of piles in cohesive and cohesionless soil.	5	CO7	L2
43	1KT16CV088	Write a note on classification of piles	5	CO7	L2
44	1KT16CV094	Explain negative skin friction in pile foundation	5	CO7	L2
45	1KT16CV098	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	5	CO7	L4
46	1KT16CV102	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
47	1KT17CV028	Explain the factors influencing the selection of depth of	5	CO7	L4

		foundation.			
48	1KT17CV029	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
49	1KT17CV031	Classify the pile foundation and explain briefly.	5	CO7	L2
50	1KT17CV032	Explain Static formula for the design of piles.	5	CO7	L2
51	1KT17CV033	With a neat sketch, explain undereamed piles.	5	CO7	L2
52	1KT17CV034	With a neat sketch, Explain Pile load test.	5	CO7	L2
53	1KT17CV035	What is meant by Efficiency of piles. Explain felds rule.	5	CO7	L2
54	1KT17CV036	Explain Settlement of piles in cohesive and cohesionless soil.	5	CO7	L2
55	1KT17CV037	Write a note on classification of piles	5	CO7	L2
56	1KT17CV038	Explain negative skin friction in pile foundation	5	CO7	L2
57	1KT17CV040	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	5	CO7	L4
58	1KT17CV041	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
59	1KT17CV042	Explain the factors influencing the selection of depth of foundation.	5	CO7	L4
60	1KT17CV050	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
61	1KT17CV053	Classify the pile foundation and explain briefly.	5	CO7	L2
62	1KT17CV055	Explain Static formula for the design of piles.	5	CO7	L2
63	1KT18CV423	With a neat sketch, explain undereamed piles.	5	CO7	L2
64	1KT18CV412	With a neat sketch, Explain Pile load test.	5	CO7	L2
65	1KT18CV424	What is meant by Efficiency of piles. Explain felds rule.	5	CO7	L2
66	1KT18CV415	Explain Settlement of piles in cohesive and cohesionless soil.	5	CO7	L2
67	1KT18CV414	Write a note on classification of piles	5	CO7	L2
68	1KT18CV416	Explain negative skin friction in pile foundation	5	CO7	L2
69	1KT18CV417	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	5	CO7	L4
70	1KT18CV418	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m	5	CO7	L4

		respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.			
71	1KT18CV419	Explain the factors influencing the selection of depth of foundation.	5	CO7	L4
72	1KT18CV411	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	5	CO7	L4
73	1KT18CV410	With a neat sketch, Explain Pile load test.	5	CO7	L2
74	1KT18CV413	What is meant by Efficiency of piles. Explain felds rule.	5	CO7	L2
75	1KT18CV420	Explain Settlement of piles in cohesive and cohesionless soil.	5	CO7	L2
76	1KT18CV425	Write a note on classification of piles	5	CO7	L2

F. EXAM PREPARATION

1. University Model Question Paper

Course:	APPLIED GEOTECHNICAL ENGINEERING					Month / Year	May /2018	
Crs Code:	17CV53	Sem:	VII	Marks:	80	Time:	180 minutes	
Module	**Note**	Answer all FIVE full questions. All questions carry equal marks.				**Marks**	**CO**	**Level**
1	a	Discuss about the importance of sub — soil exploration program.				04	CO1	L2
	b	Explain the method of seismic refraction.				06	CO1	L2
	c	What are the methods available for dewatering? Explain any one method.				06	CO1	L2
		OR						
-	a	Explain the wash boring method, with the help of a neat sketch.				08	CO1	L2
	b	Establish the location of ground water in a clayey strata, water in bore was bailed out to a depth of 10.67m below ground surface and rise of water recorded at 24 hour interval. h1 = 64.0cm , h2 = 57.9cm and h3 = 51.8cm.				08	CO1	L3
2	a	Derive the expressions for vertical stress and shear stress by using Boussinesq's theory. Also compare this theory with Westergaard's theory.				06	CO2	L2
	b	Write a note on pressure distribution diagrams.				04	CO2	L2
	c	A load of 1000KN acts as a point load at the surface of a soil mass. Estimate the stress at a point 3m below and 4m away from the point of action of the load of Boussinesq's formula. Compare the value with the result from Westergaard's theory.				06	CO2	L3
		OR						
-	a	Explain with sketches various types of settlements. Comment on the sustainability of these types of settlements and functional utility of the structure.				08	CO3	L2
	b	A soft clay layer is 5m thick and lies under newly constructed building. The effective pressure due to overlying strata is 300kN/m ^{2} and new construction increased the overburden by 120kN/m ^{2} . If liquid limit is 80%, natural water content of the clay layer is 43% and G=2.70. Dry density of the clay is 18kN/m ^{3} . Compute the settlement.				08	CO3	L3
3	a	Define At rest, Active and Passive Earth pressures.				04	CO4	L2
	b	Explain Rankine's theory for calculating Active pressure in cohesion less soils for no surcharge.				05	CO4	L2
	c	With neat sketch, explain Rebhann's graphical method of finding active earth pressure on a retaining wall				07	CO4	L4
		OR						
-	a	Explain the causes for a slope failure and list the types of slope failures.				05	CO5	L2
	b	Explain Swedish method of slices of stability analysis of slopes.				05	CO5	L2

	c	c. A 5m deep canal has side slopes of 1:1. The properties of soil are Cu = 20kN/m2, Ø = 10° , e = 0.8 and G = 2.8. If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion when the canal runs full. Also fmd the factor of safety in case of sudden draw down, if the Taylor's stability number for this condition is 0.137.	06	CO5	L4
4	a	Define : i) Ultimate bearing capacity ii) Safe bearing capacity.	04	CO6	L2
	b	Discuss effect of water table on bearing capacity of soil.	06	CO6	L2
	c	A square footing placed at a depth of 1m is required to carry a load of 1000kN. Find the required size of footing given the following data : C = 10kN/m2 , Ø = 38° , y = 19kN/m3. For Ø = 38°. Terzaghi's bearing capacity factors are N_c = 61.35 , N2 = 48.93 , N_y = 74.03. Assume water table is at base of footing.	06	CO6	L4
		OR			
-	a	Discuss the proportioning of combined footings.	04	CO6	L5
	b	Explain the following : i) Corrections to SPT 'N' value. ii) Use of plate load test results to calculate bearing capacity of soils.	06	CO6	L2
	c	A circular footing rests on a pure clay with qu = 270 kN/m^2 at a depth of 1.8m. Determine the diameter of the footing if it has to transmit a load of 720 kN. Assume the bulk unit weight of soil as 181(N/m3 and the factor of safety as 3.	06	CO6	L4
5	a	Mention the situations where pile foundation is necessary and explain the classification of piles.	08	CO7	L2
	b	Design a friction pile group to carry a load of 3000 kn including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.	08	CO7	L4
		OR			
-	a	Explain determination of the pile load capacity in detail.	05	CO7	L2
	b	Explain the factors influencing the selection of depth of foundation.	05	CO7	L2
	c	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	06	CO7	L4

2. SEE Important Questions

Course:	APPLIED GEOTECHNICAL ENGINEERING					Month / Year	May /2018	
Crs Code:	17CV53	Sem:	7	Marks:	80	Time:	180 minutes	
	Note	Answer all FIVE full questions. All questions carry equal marks.				-	-	
Module	Qno.	Important Question				**Marks**	**CO**	**Year**
1	1	What is subsurface exploration? What are the objectives of soil exploration?				06	CO1	2015
	2	Explain the method of seismic refraction.				07	CO1	2015
	3	What are the methods available for dewatering?explain any one method				07	CO1	2015
	4	Explain briefly stabilization of bore holes.				06	CO1	2016
	5	Estimate the position of the ground water table from the following data obtained from the field. Depth upto which water is boiled out is 30m. Raise in water levels : on first day 2.2m, second day 1.8m and third day 1.5m.				08	CO1	2017

	6	A sampling tube has inner diameter of 70mm and cutting edge of 68mm. its outside diameters are 72 mm and 74mm respectively. Determine area ratio, inside clearance, outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 580mm with length of sample recorded being 520mm. find the recovery ratio.		CO1	2017
2	1	Write a note on pressure distribution diagrams.	06	CO2	2015
	2	Derive the expressions for vertical stress and shear stress by using Boussinesq's theory. Also compare this theory with Westergaard's theory	08	CO2	2015
	3	A load of 1000KN acts as a point load at the surface of a soil mass. Estimate the stress at a point 3m below and 4m away from the point of action of the load of Boussinesq's formula. Compare the value with the result from Westergaard's theory	06	CO2	2015
	4	Write a note on settlement of footings.	08	CO3	2016
	5	A saturated clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of clay layer is 300KPa and load due to a new building increase the pressure by 200KPa. The liquid limit of the soil is 75%. Water content of soil is 50%. GS — 2.7. Estimate consolidation settlement.	08	CO3	2016
	6	Discuss the proportion of isolated footing.	06	CO3	2016
	7	Explain construction and uses of Newmarks chart.	06	CO2	2016
3	1	Define At rest, Active and Passive Earth pressures.	06	CO4	2015
	2	Explain Rankine's theory for calculating Active pressure in cohesion less soils for no surcharge.	06	CO4	2015
	3	A soft clay layer is 5m thick and lies under newly constructed building. The effective pressure due to overlying strata is 300kN/m and new construction increased the overburden by 120kN/m.If liquid limit is 80%, natural water content of the clay layer is 43% and G=2.70. Dry density of the clay is 18kN/m3.Compute the settlement.	08	CO4	2016
	4	What are the causes for failure of slopes?	06	CO5	2016
	5	Discuss the Swedish method of slices for a cohesive frictional soil.	08	CO5	2017
	6	An embankment is inclines at an angle of 35˚ and its height is 15m. the angle of shearing resistance is 15˚ and the cohesion intercept is 200KN/m2 . The unit weight of soil is 18.0KN/m3. If Taylor's stability number is 0.06, find the factor of safety with respect to cohesion.	06	CO5	2017
4	1	Define safe bearing capacity, safe bearing pressure and allowable bearing pressure.	06	CO6	2015
	2	Write a note on standard penetration test and its corrections.	08	CO6	2015
	3	Calculate the ultimate bearing capacity of a 2m wide square footing resting on the ground surface of a sand deposit with the following properties : i) Unit weight 18.6 KN/m3 ii) Angle of internal friction 35˚. Also calculate UBC of same footing when it is placed at depth of lm below the ground surface. Take Nq = 41.4 , N, = 42.2.	06	CO6	2015
	4	Discuss effect of water table on bearing capacity of soil.	06	CO6	2016
	5	A square footing placed at a depth of 1m is required to carry a load of 1000kN. Find the required size of footing given the following data : C = 10kN/m2 , $\emptyset$ = 38˚ , y = 19kN/m3. For $\emptyset$ = 38˚. Terzaghi's bearing capacity factors are N_c = 61.35 , N2 = 48.93 , N_y = 74.03. Assume water table is at base of footing.	08	CO6	2017
	6	A circular footing rests on a pure clay with qu = 270 kN/m^2 at a depth of 1.8m. Determine the diameter of the footing if it has to transmit a load of 720 kN. Assume the bulk unit weight of soil as 181(N/m3 and the factor of safety as 3.	08	CO6	2017
5	1	Explain the factors affecting the choice of foundation.	06	CO7	2015
	2	Write a note on classification of pile foundations.	08	CO7	2015
	3	Explain negative skin friction in pile foundation	06	CO7	206
	4	Explain determination of the pile load capacity in detail.	06	CO7	2016
	5	Design a friction pile group to carry a load of 3000 kn including the weight	08	CO7	2017

		of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure.			
	6	A group of nine piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length s of the piles were 30cm and 10m respectively. The cohesion C = 35kN/m2. If the piles were spaced at 90cm c/c, compare the bearing load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5. Neglect bearing at the tip of the piles. Take m=0.6 for shear mobilization around each pile.	06	CO7	2017

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Module-#	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Objectives and Importance, Stages and Methods of exploration- Test pits, Borings, Geophysical methods, stabilization of boreholes, Sampling techniques, Undisturbed, disturbed and representative samples, Geophysical exploration and Bore hole log. Drainage and Dewatering methods estimation of depth of GWT (Hvorslev's method).	10	1	L2	Understand	Lecture	SLIP TEST/CIA
2	Introduction, Boussinesq's and Westergaard's theory - concentrated load, circular and rectangular load, equivalent point load method, pressure distribution diagrams and contact pressure, Newmark's chart. Foundation Settlement - Approximate method for stress distribution on a horizontal plane, Types of settlements and importance, Computation of immediate and consolidation settlement.	10	2	L3	Apply	Lecture	SLIP TEST/CIA
3	Active, Passive and earth pressure at rest, Rankine's theory for cohesionless and cohesive soils, Coulomb's theory, Rebhann's and Culmann's graphical construction. Assumptions, infinite and finite slopes, factor of safety, use of Taylor's stability charts, Swedish slip circle method for C and C-ϕ (Method of slices) soils, Fellineous method for critical slip circle	10	2	L3	Apply	Lecture	SLIP TEST/CIA
4	Types of foundations, determination of bearing capacity by Terzaghi's and BIS method (IS: 6403), Effect of water table and eccentricity, field methods - plate load test and SPT. Proportioning of shallow foundations- isolated and combined footings (only two columns)	10	2	L3	Apply	Lecture	SLIP TEST/CIA
5	Types of foundations, determination of	10	2	L3	Apply	Lecture	SLIP

	bearing capacity by Terzaghi's and BIS method (IS: 6403), Effect of water table and eccentricity, field methods - plate load test and SPT. Proportioning of shallow foundations- isolated and combined footings (only two columns)						TEST/CIA

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Module-#	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome **Student Should be able to ...**
A	*I*	*J*	*K*	*L*	*M*	*N*
1	Students are able to find the properties of soil by exploration of soil for construction of structures	Characterisation of soil	Soil Exploration	Characterisation of soil	Understand	Students are able to find the properties of soil by exploration of soil for construction of structures
2	Students are able to analyse the distribution of stress in soil under loading	Analysis of stress in soil	Stress in Soils	Analysis of stress in soil	Apply	Students are able to analyse the distribution of stress in soil under loading
2	Students are able to analyse the settlement of foundation under loading in cohesive and cohesion-less soil	Analysis of foundation settlement	Stress in S	Analysis of foundation settlement	Apply	Students are able to analyse the settlement of foundation under loading in cohesive and cohe
3	Students are able to analyse lateral earth pressure in soil at rest	Analysis of pressure in soil	Lateral Earth Pressure	Analysis of pressure in soil	Apply	Students are able to analyse lateral earth pressure in soil at rest
3	Students are able to analyse the factor of	Stability analysis	Stability of Slopes	Stability analysis	Apply	Students are able to analyse the factor of safety against failure of earth slope

	safety against failure of earth slope					
4	Students are able to evaluate bearing capacity of shallow foundation by Terzaghis and B.I.S method	Computation of bearing capacity	Bearing Capacity of Shallow Found	Computation of bearing capacity	Apply	Students are able to evaluate bearing capacity of shallow foundation by Terzaghis and B.I.S method
5	Students are able to analyse the capacity and efficiency of single and group of piles in cohesive and cohesion-less soil	Strengthening of pile foundation	Pile Foundations	Strengthening of pile foundation	Apply	students are able to analyse the capacity and efficiency of single and group of piles in cohesive and cohesion-less soil