EX/CE/5/T/406/2017 (old)

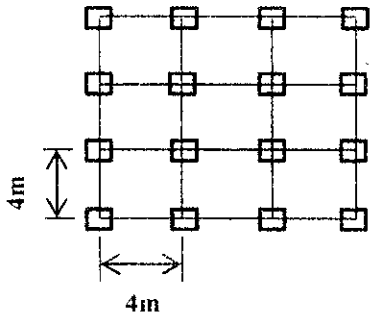
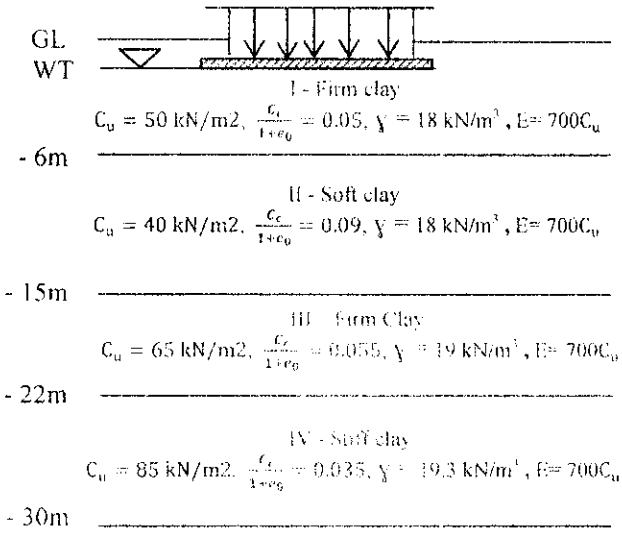
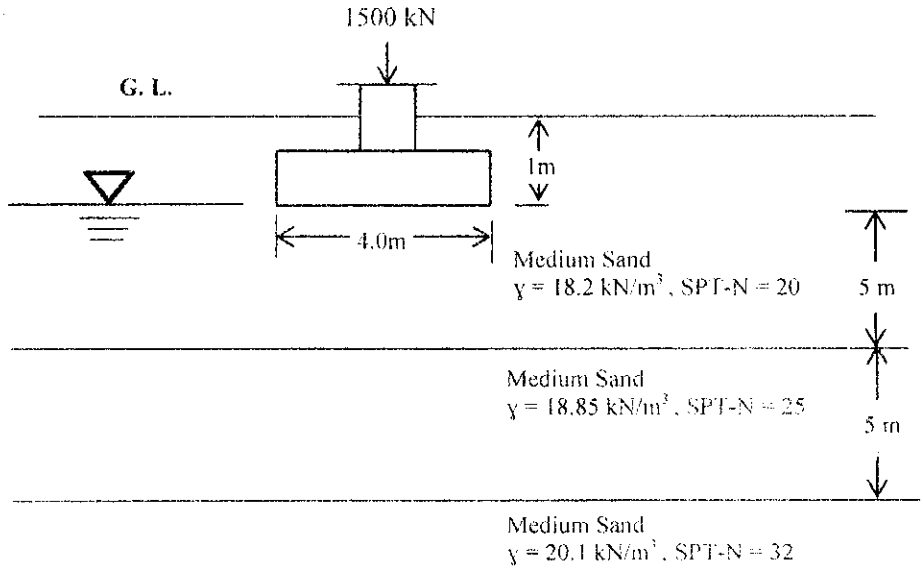
B.E. CIVIL ENGINEERING (PART TIME) EXAMINATION, 2017

(4^{TH} Year, 2^{ND} Semester)

DESIGN OF FOUNDATION

[PART-I]

Time: Three Hours | Full Marks 100 (50 marks for this part)

Question No.	(Answer all the questions.) [Assume any data reasonably if necessary]	
1	Design a raft foundation for the building shown in Figure below:  [Inner Columns = 720 kN each] Outer Columns = 600 kN each]  	[20]
2	A 4m x 4m foundation is placed 1m below GL in a stratified sandy deposit as depicted in the following figure. Calculate the settlement of the foundation using (a) Elastic Theory and (b) Buisman method. [$C_1 = 39\frac{kg}{cm^2}, C_2 = 4.5\frac{kg}{cm^2}/blow$]  	[15]

B.E. CIVIL ENGINEERING (PART TIME) EXAMINATION, 2017

(4TH Year, 2ND Semester)

DESIGN OF FOUNDATION

[PART-I]

Time: Three Hours | Full Marks 100 (50 marks for this part)

Question No.	(Answer all the questions.) [Assume any data reasonably if necessary]	
3	The following observations relate to a plate load test conducted on a 60cm square test plate placed at a depth of 2.0m below ground surface in a cohesionless soil deposit:	[7]

Load Intensity (t/m^2)	0	5	10	15	20	25	30	35	40
Settlement (mm)	0	2	4	7.5	11	16.3	23.5	34	45

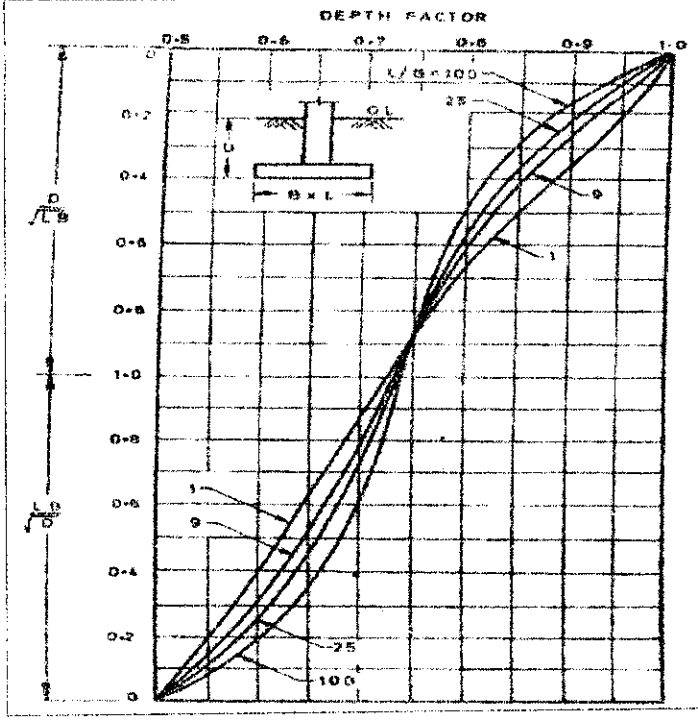
(a) Plot the load settlement curve

(b) Determine the settlement of a foundation 3.0m x 3.0m carrying a load of 110t and located at a depth of 3m below ground surface.

[Water Table is located at large depth from ground surface]

4(a)	Write a short note on 'Differential settlement'.	[5+3]
(b)	Draw contact pressure distribution diagram of rigid footing resting on cohesionless and cohesive soil.	

Required Graphs and Tables



Shape	Influence Factor (I)		
	Centre	Corner	Average
(1)	(2)	(3)	(4)
Circle	1·00	0·64 (edge)	0·85
Square	1·12	0·56	0·95
Rectangle:			
L/B = 1·5	1·36	0·68	1·20
2	1·53	0·77	1·31
5	2·10	1·05	1·83
10	2·52	1·26	2·25
100	3·38	1·69	2·96

Ex/ CE/ 5/ T/ 406/ 2017 (old)

B.E. CIVIL ENGINEERING (PART TIME) FOURTH YEAR SECOND SEMESTER (OLD), 2017

DESIGN OF FOUNDATION

Time: 3 HRS | Full Marks: 100

Part – II (50 Marks)

Answer any five questions

1. (a) What is pile foundation? What do you understand by compaction pile and tension pile? 2+3

(b) How can you determine pile load carrying capacity from standard penetration test results? Describe it clearly. 5

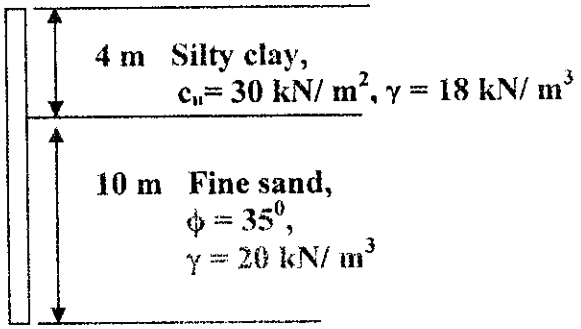
2. (a) What is meant by "Critical depth"? Explain 3

(b) Calculate allowable load carrying capacity of a circular bored pile with diameter 60 cm and penetrating through two layers of soil. The soil properties in each layer are given below. 7

For $c_u = 30$ kN/ m^2, adhesion factor is 1.0

For $\phi = 35^0$, $N_q = 50$

Ground water table is at 2 m below ground surface.



3. (a) A group of 9 piles with 3 piles in a row was driven into a soft clay extending from ground level to a great depth. The diameter and the length of the piles were 30 cm and 10 m respectively. The unconfined compressive strength of clay is 70 kPa. If the piles were placed 90 cm c/c, compute the allowable load on the pile group on the basis of a shear failure criterion for a factor of safety of 2.5. Take $\alpha = 1.0$. 7

(b) Write a short note on "Negative skin friction". 3

4. (a) What is meant by dynamic load carrying capacity of pile? 2

(b) Explain "Hiley's formula" for dynamic pile load carrying capacity. 4

(c) For which type of soil dynamic formulae are appropriate? 1

(d) How can you classify a pile long or short with reference to stiffness factor of pile-soil system? 3

5. (a) A typical column of the multi-storeyed building is subjected to the following loads at ground level.

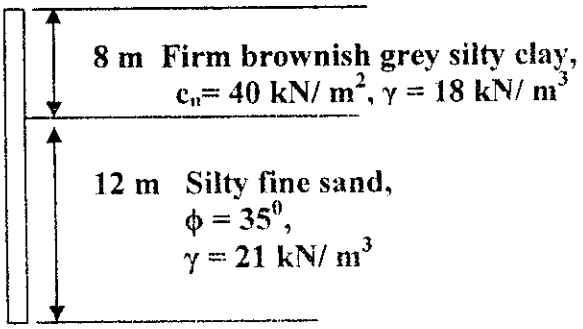
Vertical Load V (kN)			M_{xx} (kN-m)		M_{yy} (kN-m)		Base Shear (kN)	
DL	LL	SL	DL+LL	SL	DL+LL	SL	H_x (SL)	H_y (SL)
5500	760	657	123.5	-	115.2	985	380	-

Using 750 mm diameter bored piles design a suitable pile group for the column. Also determine the moment due to horizontal load for which the section should be designed. The soil profile is given below. 10

For c_u= 40 kN/ m^2, adhesion factor is 1.0

For $\phi = 35^0$, $N_q = 50$

Ground water table is at ground surface.



Pile is 20 m long. Take stiffness factor of pile-soil system is 5 m.

For $L_f/R = 0$, $L_f/R = 1.65$ and reduction factor of moment is 0.7

6. (a) What is lateral resistance of pile? 2

(b) Explain Brom's method to estimate ultimate lateral resistance of pile. 8

7. (a) Three parallel strip footing 3 m wide and 5 m apart centre to centre transmit contact pressures of 200, 150, 100 kN/ m^2 respectively. Calculate vertical stress due to the combined loads beneath the centres of each footing at a depth of 3 m below the base. Assume the footings are placed at a depth of 2 m below the ground surface. Use Boussinesq's method for line loads. 7

(b) What are the assumptions generally used in Boussinesq equation? 3

8. (a) What do you mean by "Pressure isobar"? 2

(b) A single concentrated load of 1000 kN acts at ground surface. Construct an isobar for vertical pressure of 40 kN/ m^2. 5

(c) How can you determine vertical pressure at a point under uniformly loaded rectangular area when point is outside of rectangular area? 3