Ref. No. EX/CON/PC/B/T/412/2024

B. E. CONSTRUCTION ENGINEERING 4TH YEAR 1ST SEMESTER - 2024

SUBJECT: UNDERGROUND CONSTRUCTION

Time : Three Hours *(50 Marks for each Part)* **Full Marks : 100**

(Use separate Answer script for each Part)

Part I

(50 Marks)

	Question No.		Marks
CO2 [20]		**Answer any two from question Q1, Q2 and Q3 in this block.**	
	Q1.	A 10.0m deep braced excavation, 30m x 30m in plan, is to be made in a sub-soil consisting of 20.0m of medium sand overlying hard clay. The ground water table is 1.0m below ground level and it is to be lowered to at least 1.00m below the bottom of excavation. What will be the average discharge of the dewatering system in cm^3 / sec ? Assume k = 3.0 x 10^{-2} cm/sec; R = 300m	10
	Q2.	Describe the method of dewatering by sumps.	10
	Q3.	i. State the different uses as well as the advantages of diaphragm wall	05
		ii. Write a short note on Guide walls in case of construction of diaphragm wall.	05
CO5 [20]		**Answer one from question (Q4a) and (Q4b) in this block.**	
	Q4a.	Find the depth of embedment below the dredge line for the cantilever sheet pile shown in Fig. A. Apply 30% increase to the computed embedment depth	15

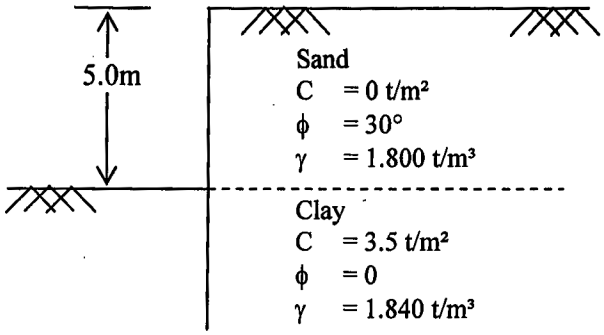

Fig. A

[Turn over

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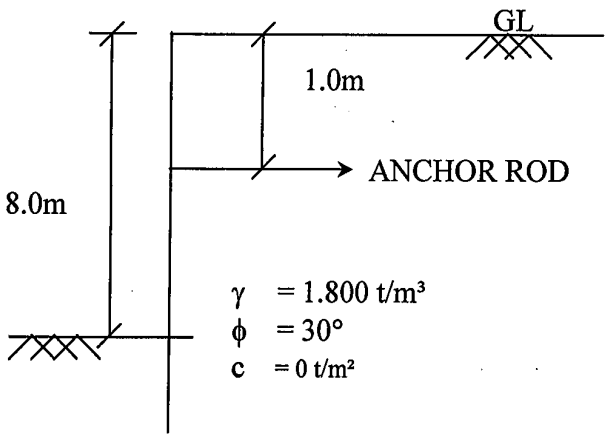
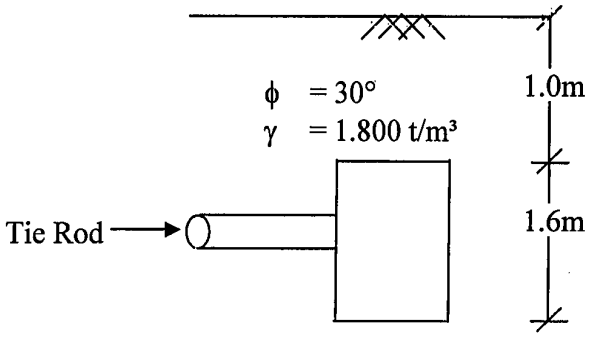
Part I
(50 Marks)

	Question No.		Marks
	Q4b.	Find by free earth support method the depth of embedment below the dredge line for the anchored sheet pile shown in Fig B. Use a 30% increase applied to the computed embedment length  **Fig. B**	15
		Answer one from question (Q5a) and (Q5b) in this block.	
	Q5a.	Find out the safe working load for the anchor block of size 1.6 m x 1.6 m located as shown in Fig. C. The spacing of anchor block is 3.25 m  **Fig. C**	05
	Q5b.	Write a short note on location of anchorages in case of anchored sheet pile wall	05
CO6 [10]	Q6.	Write a short note on ground settlement in clayey strata.	10

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BE Construction Engineering 4th yr 1st Semester examination 2024

Underground construction

Time : Three hours | Full Marks : 100

(50 Marks for each Part)

Part-II(**50 Marks**)

Answer any two questions .

Assume relevant data if required.

Q-1. (a) A cut [12 m wide , 14 m deep] is to be made in a two layered clay. The first layer starts from existing G.L and extends up to 12m below .G.L with C= 2.0 t/m^2 , γ = 1.83 t/m^3 followed by the second layer with C= 4.5 t/m^2 , γ = 1.88t/m^3 which continues up to 20 m below G.L. The ground water table was found to lie at 3m below G.L. Is the cut is safe against base failure and bottom heave ? If not suggest your recommendation to make the cut safe. Moreover estimate the strut load on three struts when placed with a vertical spacing of 3m c/c and horizontal spacing of 3.5m c/c. (15)

(b) . Explain clay bursting. How to make a braced cut safe against clay bursting. Is clay bursting will occur in the cut as mentioned in Q-1(a) (10)

Q-2. Explain Terzhaghi's general wedge theory for estimation of earth pressure in cuts in sandy soil deposit . (10)

(b) Explain the arching process , its significance in underground construction and the factors on which arching in soil are significant. (10)

© Write note on ditch conduit. (5)

Q-3 (a) . A RCC rectangular tunnel [10m wide and 8 m deep] floor is located at a depth of 50m below existing ground level in a sandy deposit with $\phi = 30^0$, γ = 1.88t/m^3 . Determine the vertical stress on tunnel roof and horizontal stress on tunnel wall . (14)

(b) Show pencil sketches of different types of support system provided in deep cut. (6)

© Determine the depth in subsoil of Q-3(a) for which no lateral support is needed for excavation. (5)