B.E. CIVIL ENGINEERING EXAMINATION, 2018

(4ᵗʰ Year, 2ⁿᵈ Semester)
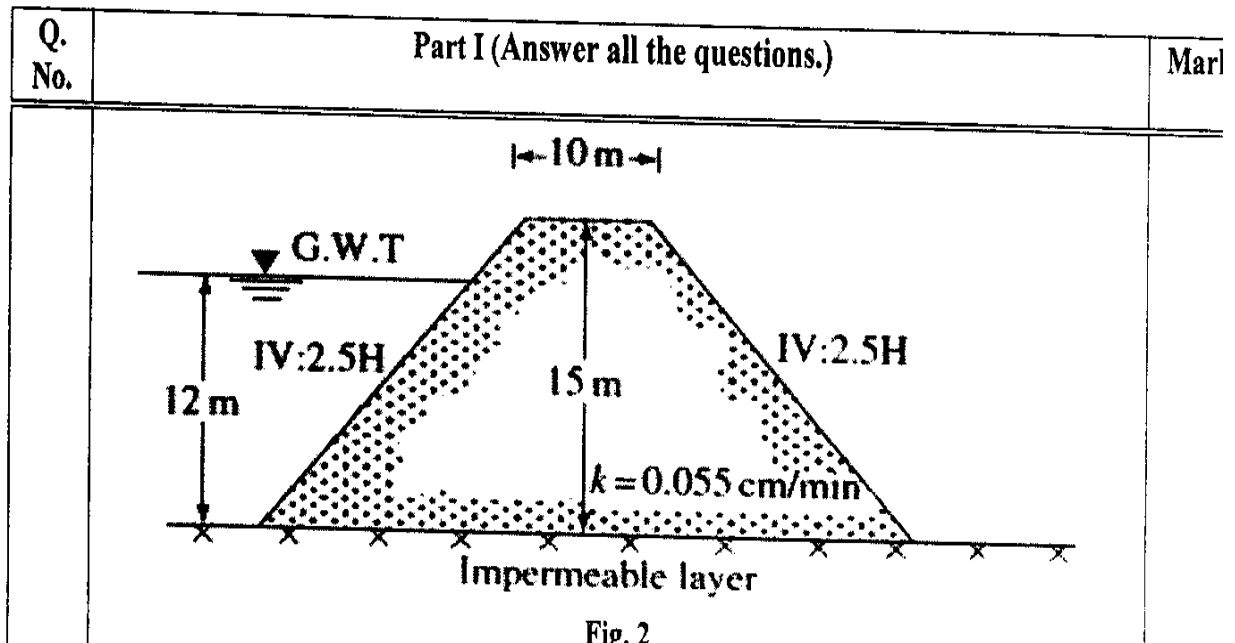
ADVANCED SOIL MECHANICS
PART-I

Time: Three Hours

Full Marks 100
(40 marks for this part)

Use a separate Answer-Script for each part
[Assume any data reasonably wherever necessary]

Q. No.	Part I (Answer all the questions.)	Marks
1 (a)	Derive a finite difference equation for the solution of one-dimensional consolidation equation. Extend the formulation for impermeable boundary condition as well.	[7]
(b)	A uniform surcharge ($q = 150$ kN/m^2) is applied at the ground surface of the soil profile shown in Fig.1. Using numerical method, determine the distribution of excess pore water pressure for the clay layer after 10 days of load application. Also calculate the degree of consolidation and compare your degree of consolidation with the theoretical value. [Theoretical U vs T$_V$ is provided in the Table 1]	[18]

Fig. 1

Table 1

U (%)	T$_V$
10	0.008
20	0.031
30	0.071
40	0.126
50	0.197
60	0.287
70	0.403
80	0.567
90	0.848

Q. No.		Marks
2 (a)	An earth dam section is shown in Figure 2. Draw the flow net and calculate the rate of seepage through the earth dam.	[10]
(b)	Write a short note on 'Preloading'	[5]

B.E. CIVIL ENGINEERING EXAMINATION, 2018

(4th Year, 2nd Semester)

ADVANCED SOIL MECHANICS
PART-I

Time: Three Hours

Full Marks 1

(40 marks for this p₂

Use a separate Answer-Script for each part

[Assume any data reasonably wherever necessary]

Q. No.	Part I (Answer all the questions.)	Marl

Fig. 2

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2018
(4TH YEAR 2ND SEMESTER)
(1st / 2nd Semester/ Repeat/ Supplementary/ Spl. Supplementary/Old/ Annual/ Biannual)
SUBJECT: ADVANCED SOIL MECHANICS (ELECTIVE)
(Name in full)

Time: Two hours/Three hours/Four hours/ Six hours   Full Marks 30/100

). of stions	PART II (60 MARKS)	Marks
	Answer all questions	
Q1	What is stress path? Draw stress path, both total stress and effective stress, for unconsolidated undrained and consolidated undrained triaxial tests	2+8=10
Q2	Consolidated drained tests were conducted on specimens collected from borrowed earth to be used for construction of an embankment. a. How the soil specimen is saturated before it is sheared in the triaxial machine? Also discuss how the saturation of the specimen is ensured. b. What are the parameters measured during triaxial test? Also illustrate how the measured parameters are used in predicting the nature of soil. c. What will be shear strength parameters if the tests give the following results: Test no.　Effective cell pressure(kPa)　Deviator stress at failure(kPa) 1　　　　70　　　　　　　　　　440 2　　　　92　　　　　　　　　　475	(4+2)+ (2+4)+ 8 = 20
Q3	Consolidation of a 15 m thick clay layer, drained at top only, is required to be accelerated using sand wick installed at a spacing of 2.2m c/c in triangular arrangement. A uniform surcharge of $8t/m^2$ is applied at the top of the clay layer. Calculate the average degree of consolidation for combined vertical and radial drainage after 100 and 150 days of load application. Also calculate time required to achieve 90% degree of consolidation. Data given : $C_{vr} = 2C_v = 0.06$ m²/day ; $r_w = 0.15$m ; $m_v = 0.006$ m²/ton GWT is at the ground level. Determine the total consolidation of the clay layer. Use the following expression for $U_r = 1 - exp[-8T_r / F(n)]$ Where, $F(n) = (n^2/(n^2 - 1))ln(n) - ((3n^2-1)/4n^2)$	4+4+4+ 3 = 15
Q4	A highway embankment of height 20m, with side slope 2H:1V, is be constructed over a hard soil deposit. Calculate the factor of safety for a typical slip circle passing through the toe of the embankment using Bishop's simplified method. Properties of Embankment soil: Bulk density = 19.5 kN/m³, c' = 65 kPa, φ' = 18⁰, $r_u = 0.3$	15