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Roll No.

EIGHTH SEMESTER

B.E. (CE)

MID SEM EXAMINATION

March

2007

**CE-411 ADVANCE GEOTECHNICAL
ENGINEERING**

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer any **TWO** questions.

Plot all the graphs/plots on the graph sheet provided.

Assume suitable missing data, if any.

- 1 The table shown below, gives data from a standard shear box test on a sample of 140 g of dry sand. The initial dimensions of the sample were 60 mm x 60 mm in plan and 20 mm in height. The test was carried out at a constant normal effective stress of 70 kPa. Plot the graphs of

- (i) shear stress against shear strain
- (ii) volumetric strain against shear strain
- (iii) specific volume against shear strain.

Comment on these graphs. Also estimate the peak and critical state effective angles of friction of the soil, and give explanations for which one should be used in engineering designs. Take the specific gravity of soil solids as 2.65.

Table : Shear box test data

Relative horizontal displacement (mm)	Upward vertical movement of shear box lid (mm)	Shear stress (kPa)
0.00	0.000	0
0.02	0.002	20
0.04	0.008	36
0.06	0.016	45
0.08	0.026	50
0.20	0.064	60
0.32	0.128	54

0.48	0.192	49
0.64	0.256	44
0.80	0.288	39
0.96	0.320	36
1.12	0.321	35

- 2[a] How sensitivity of a soils is defined and how it is measured. Give a soil classification based on sensitivity. 3
- [b] What is metastable fabric of a soil? Give explanation, how it causes sensitivity. 3
- [c] A pile of circular cross-section , 16 m long and 0.5 m in diameter, is installed in a soft clay of unit weight 18 kN/m^3 . The pile is required to resist an applied upward vertical load by friction between the pile and the surrounding soil. Estimate the ultimate capacity of the pile;
- in the short-term, if the undrained shear strength of the clay at the clay-pile interface increases linearly from zero at the soil surface to 30 kPa at the base of the pile.
 - in the long-term , if the clay-pile interface has an effective angle of friction of 20° , pore water pressures are hydrostatic below a water table at the soil surface, and the ratio of the horizontal effective stress to the vertical effective stress is 0.5 at all depths.
- 4
- 3 Table given below presents data from consolidated undrained triaxial compression tests on three samples of a particular type of clay. Give your reasons to identify the peak and the critical state strengths for each test. Further explain, why is it not possible to identify a critical state strength in test 3. On one diagram, plot the Mohr circles of stress at the peak strength for all three test, and sketch the peak strength failure envelope. On a separate diagram, plot the Mohr circles of stress at the critical state for tests 1 and 2, and estimate the critical state strength ϕ'_{crit} .

Table : Triaxial Test Data

	Axial strain (%)	Deviator stress (kPa)	Pore water pressure (kPa)
Test 1	3.89	207.9	235.1
Cell pressure 410 kPa. Initial back pressure 200 kPa	4.56	219.2	230.5
	5.68	232.5	222.7
	6.74	240.5	215.8
	7.91	241.0	216.2
Test 2	6.87	132.4	349.6
Cell pressure 450 kPa. Initial back pressure 310 kPa	7.36	138.8	346.7
	8.44	145.3	339.8
	9.40	151.3	333.0
	10.38	152.6	329.0
	11.63	152.8	329.2
Test 3	2.05	72.7	371.4
Cell pressure 420 kPa. Initial back pressure 340 kPa	3.34	87.4	367.0
	4.18	95.9	363.3
	5.80	91.8	351.1
	6.60	83.5	345.7

For each of the three tests, determine the undrained shear strength. Explain why this is different for each case. Suggest a relationship between undrained shear strength and depth in a uniform bed of this clay having unit weight 18 kN/m^3 and a water table at the surface of the deposit.

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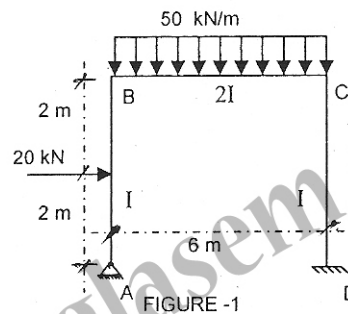
CE-411 ADVANCED STRUCTURAL ANALYSIS

Time: 1 Hour 30 Minutes

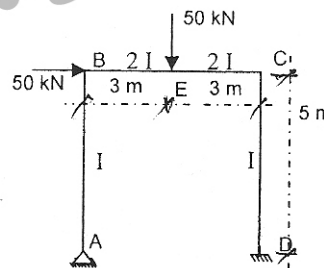
Max. Marks : 20

Note : Answer any TWO questions.
Assume suitable missing data, if any.

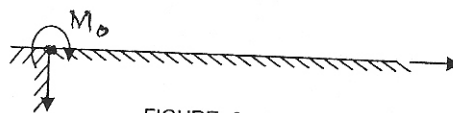
- 1 Analyze the frame shown in Fig.1 using Kani's method and draw BMD and SFD.



- 2 Analyze the frame shown in Fig.2 using flexibility method and draw BMD and SFD.



- 3 Find the deflection curve for a semi infinite beam shown in Fig.3 on an elastic foundation hinged at the end and acted upon by a couple M_0 .

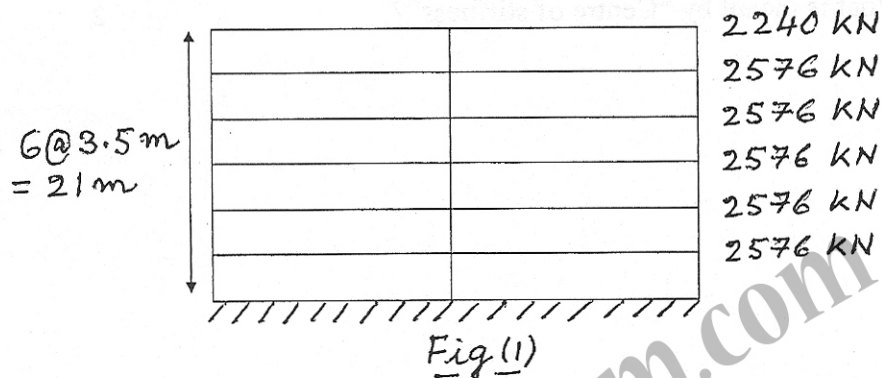


Note : Answer ALL questions.

IS 1893 is not permitted.

Assume suitable missing data, if any.

- 1 A six storeyed building, whose elevation is shown in Fig (1), is subjected to a base shear of 2000 kN during an earthquake. 4



Seismic weights of different stories are marked in Fig (1). Distribute the base shear in the building.

- 2 Explain how do you determine the value of design horizontal acceleration spectrum value (A_h) for the calculation of design base shear. 2
- 3 Discuss what do you understand by "plan irregularity" in a building. 2
- 4 Explain, what do you understand by "Magnitude of an Earthquake", in brief. 2
- 5 Explain, in steps, how do you calculate seismic weight of a RC framed building. 2
- 6 Explain, how "Primary waves" are different from "Secondary waves", in brief. 2
- 7 What do you understand by "Comprehensive Intensity Scale"? Write its features in brief. 2
- 8 What do you understand by "Response Redirection factor"? 2
- 9 What is meant by "Centre of stiffness"? 2

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CE-412 STRESS ANALYSIS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer Q.1 and any TWO questions from the remaining.
Assume suitable missing data, if any.

1 Answer any FOUR questions:

- [a] What are stress Invariants?
- [b] Define laws of stress transformation.
- [c] Define admissible combination of σ_n and τ_n for $\sigma_1 > \sigma_2 > \sigma_3$
- [d] Define double refracting material.
- [e] Explain effect of superposition of two light waves.
- [f] Define material fringe value.
- [g] What is a wave plate?
- [h] Define "Isoclinis" and "iso chromatics"

2x4=8

2 Determine value of principal stress from the following of stress tensor.

$$\sigma_{ij} = \begin{bmatrix} 2 & 3 & 4 \\ 3 & 5 & 6 \\ 4 & 6 & 8 \end{bmatrix} \text{ N/mm}^2$$

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3 If $\sigma_1=3$, $\sigma_2 = 4$ and $\sigma_3 = -6$ N/mm² respectively determine normal and shear stress on a plane $2x + 3y - 5z = 0$. Give graphical representation also.

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4 Discuss the effect of stressed model in plane polariscope.

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5 Derive stress -optic law. Explain the use of stress-optic law.

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**CE-413 DESIGN OF PRESTRESSED
CONCRETE & TIMBER STRUCTURES**

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer **ALL** questions.

Use of IS 1343-1980 is not permitted.

Assume suitable missing data, if any.

- 1 Write the advantages of prestressed concrete. 4
- 2 Explain why anchorages are not required in pretensioned concrete. 2
- 3 Discuss two post tensioning anchorage systems. Explain how they work. 4
- 4 Explain the concept of "Load Balancing". 2
- 5 A rectangular concrete beam of cross section 300 mm depth and 200 mm width is prestressed by 15 wires of 5 mm diameter, provided at an eccentricity of 100 mm from the axis of beam towards the soffit. Assuming the prestress in steel as 800 N/mm^2 , calculate the stresses at the extreme fibres of beam at the centre of span of beam. The beam has a span of 6m and it supports a uniformly distributed live load of 4 kN/m over whole of its length. Density of concrete is 24 kN/m^3 . The beam is simply supported at the supports. Consider self weight of beam also. 4
- 6 Explain why post tensioning may not be preferred to pretensioning for a structural member of a short length. 2
- 7 Explain loss of prestress due to elastic shortening of concrete. 2