Tanta University

Department: Structural Eng. Dept.
Max. Credit 100 % only

Faculty of Engineering

Course Title: Design of Metallic Structures	**Course Code:** CSE3111	**Year:** 3rd
Date: January 2010 (First term)	**Allowed time:** 3 hrs	**No. of Pages:** (3)

Remarks: 1- It is allowed to use any tables or Egyptian Code of Practice books. 2- Any missing data may be reasonably assumed. 3- Attempt all questions.

1) The steel skeleton of a car shed is built up of trusses type shown below. The system shown is **a double cantilever truss supported on a fixed column (a-b-c-d,** Given the following data, answer the required questions.

Data:

- Spacing between trusses	= 5.0	m	
- Own weight of steel structure	≈ 0.35	kN/m^2	of covered area.
- Live load	= 0.6	kN/m^2	
- Weight of cover	= 0.20	kN/m^2	
- Use steel grade **St37**.			

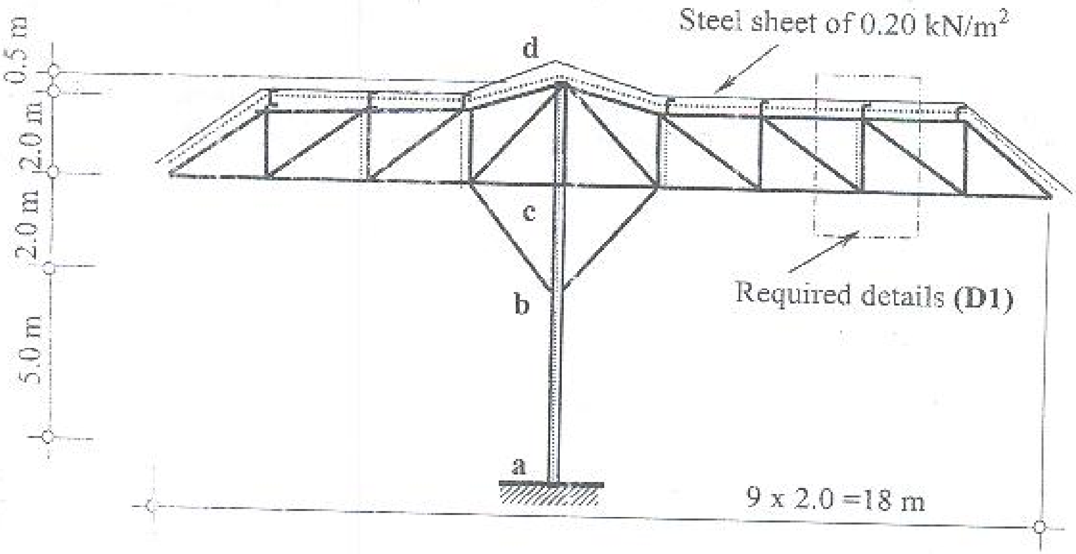


Fig. (1)

Required:

a) Draw with suitable scale different views showing the arrangements of bracing systems. The length of the covered area is 30.0 m. **(20 %)**

b) Calculate the design forces in marked members at Detail (**D1**). (**Do not design the attached members**). Neglect wind load. **(12 %)**

c) Design an intermediate purlin as rolled steel section. **(12 %)**

d) By assuming truss members at required detail (**D1**), draw to scale 1:10 this detail **(D1)** of Fig. (1). **(16 %)**

P.T.O.

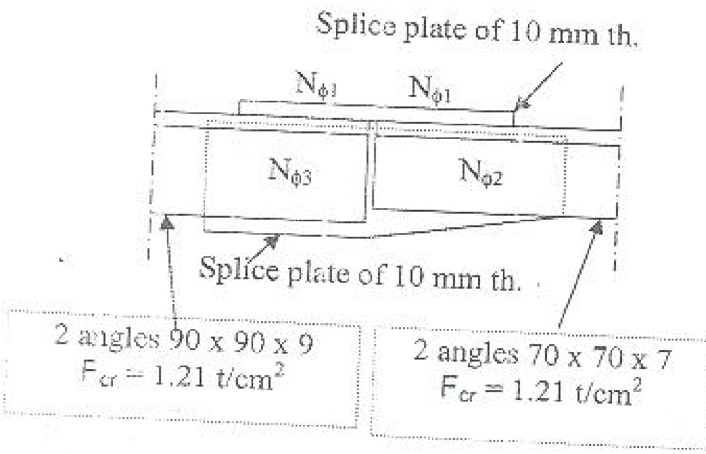
2) The following table shows D.L., L.L. and W.L. By calculating the design **ultimate forces** of the following separate truss members, **design** the members as rolled steel sections taken into consideration that all the members are connected with the gusset plates with **ordinary bolts M16 mm**. **Calculate, also, the number** of bolts required for connecting the following separated members with there gusset plates.

(30%)

member	D.L [t]	L.L [t]	W.L [t]	Length L_h [m]	L_{bx} [m]	L_{by} [m]	notes
1	7.0 (comp.)	8.0 (comp.)	3.0 (comp.)	5.0	5.0	10.0	upper chord
2	3.0 (comp.)	10.0 (comp.)	2.0 (comp.)	5.0	5.0	5.0	lower chord
3	2.0 (tension)	9.0 (tension)	5.0 (tension)	7.0	--	--	Vertical
4	5.0 (tension)	6.0 (tension)	10.0 (tension)	5.0	--	--	horizontal
5	Zero	Zero	Zero	4.0	?!	?!	----

3. The following drawing is a splice in a compression member with variable cross-section. It is required to calculate the number of connected bolts $N_{\phi1}$, $N_{\phi2}$ and $N_{\phi3}$.

(10%)

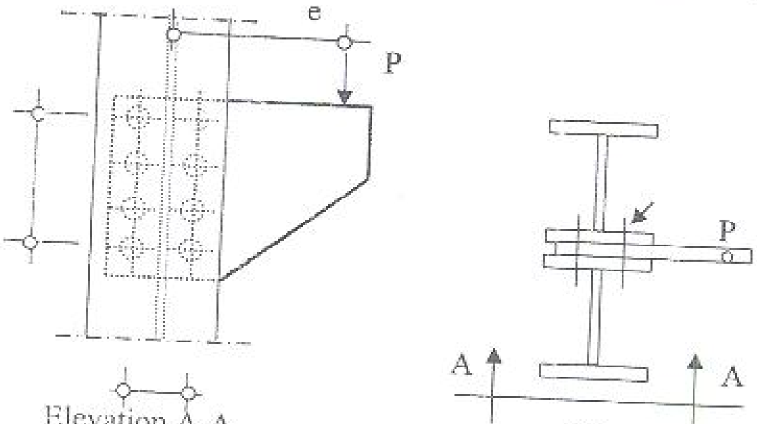


P.T.O.

4. Without calculations, discuss the straining actions of the following connections:

(a)

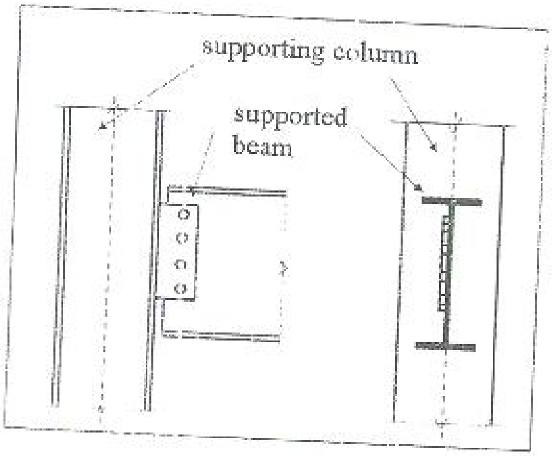
(20%)



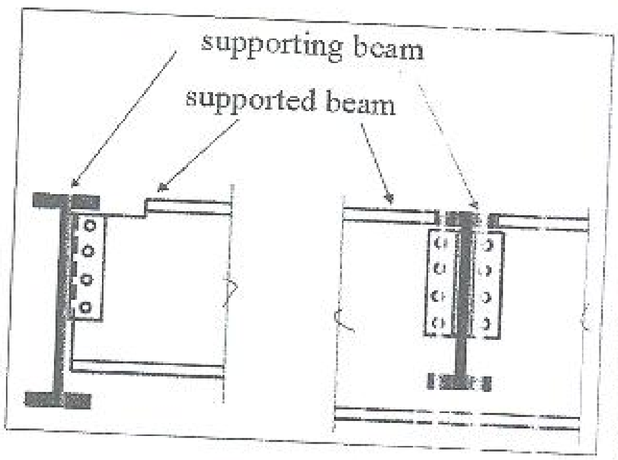
Elevation A-A

Plan

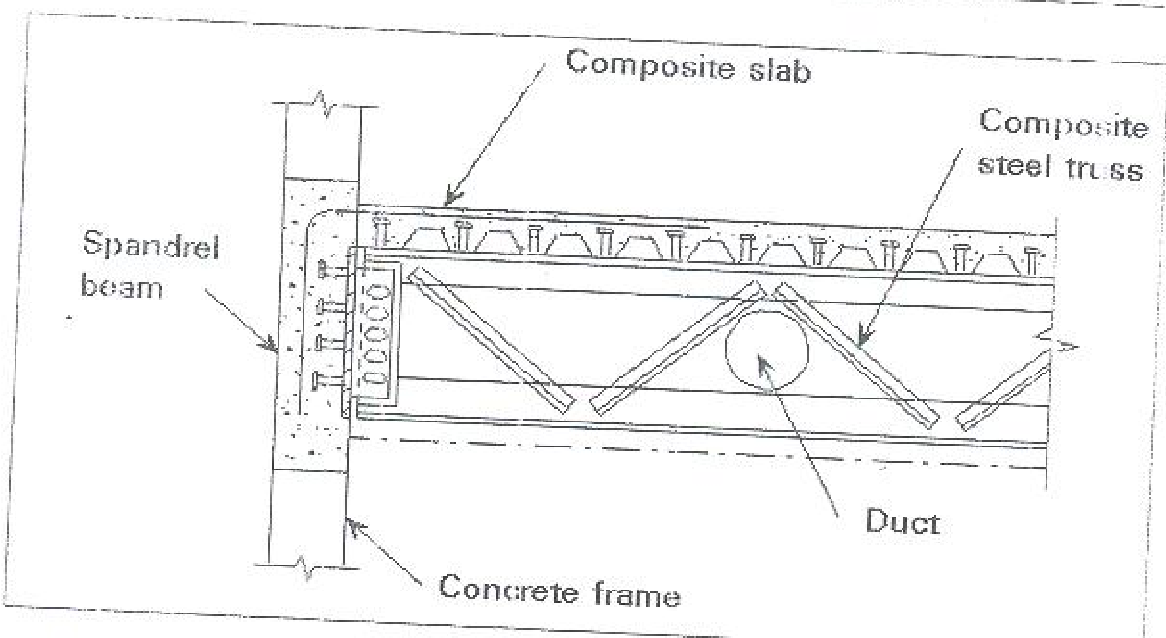
(b)



(c)



(d)



With best wishes,

Course Examination Committee:

Prof. Dr. Mohamed A. Dabaon, Dr. Mahmoud A. El-Bougdadi, Dr. Omnia F. Kharob, Prof. Dr. Saher El-Khoriby

Course Coordinator: Prof. Dr. Mohamed A. Dabaon

Tanta University | Department: Structural Engineering | Faculty of Engineering
Total Marks: 75 Marks

Course Title: Soil Mechanics (2) | Course Code: CSE3112 | Year: 3rd Civil Eng.
Date: 31 January 2010 (First term) | Allowed time: 3 hrs | No. of Pages: (3)

- Assume any missing data
- Answers should be supported by sketches

Question Number (1) ***(19 Marks)***

a) What is the main goal of compacting soil? (3 Marks)

b) Describe briefly using clear sketches how to assess the maximum dry density of compacted sand in the field using the sand cone device. (3 Marks)

c) State the main differences between the standard and the modified proctor tests. (3 Marks)

d) Discuss the main factors that affect the soil compaction. (3 Marks)

e) The following results were obtained using a standard proctor test: (7 Marks)

Moisture content (%)	5	8	10	13	16	19
Bulk density (Mg/m^3)	1.87	2.04	2.13	2.20	2.16	2.09

If the specific gravity of the tested soil is 2.70, it is required to:

1. Draw the graph of dry density against moisture content and determine the maximum dry density and optimum moisture content.
2. On the same axes, draw the curves for zero and 5 per cent air voids, and determine the air-voids content at maximum dry density.
3. Under field conditions variations in the applied compaction effect may cause the air-void content to vary by ±2 per cent. Also, the field moisture content may vary above and below the optimum value by 3 per cent. Indicate, therefore, the range of dry densities that may be found after compaction in the field.

Question Number (2) ***(19 Marks)***

a) Draw net sketches showing the details of reinforcement for counter-fort wall. (5 Marks)

b) For the reinforced concrete retaining wall shown in Fig. (1), it is required to:- (14 Marks)

1. Check the stability of this wall, if the allowable bearing capacity for the supporting soil is 13 kN/m^2.
2. Find out the required reinforcement for the wall and base.
3. Draw to scale 1/25 the cross section of this wall showing the arrangement of the reinforcement.

Question Number (3) ***(19 Marks)***

a) Explain the factors affecting the bearing capacity of soil. (4 Marks)

b) Explain the effect of the ground water table on bearing capacity of soil in cases of:
(i) sand. (ii) clay. (4 Marks)

P.T.O.

c) Explain using sketches the concept of floating foundations. (3 Marks)

d) Find the maximum allowable load (P) to achieve factor of safety of 3 under square footing shown in Fig. (2). (8 Marks)

Question Number (4) ***(18 Marks)***

a) An infinite slope exists at an angle "β" to the horizontal in a clay soil having a unit weight "γ" and effective strength parameters "c'" and "φ'". Derive an expression for the factor of safety against failure along a shallow slip plane parallel to the ground surface. (4 Marks)

b) Use the expression derived in (a) to find the maximum stable slope where $c' = 0$, $\varphi' = 20°$ and $\gamma = 19$ kN/m^3. (2 Marks)

c) Fig. (3) shows the section through a cutting in clay. ABC is a trial slip surface and CD is an assumed tension crack, 4.5 m deep. The area ABCDE is 152 m^2 and its centroid is at G. The crest of the slope shall be loaded by a live load of 20 kN/m^2 as shown in figure. The density of the soil is 1.92 t/m^3 and its cohesion is 43 kN/m^2. Find the factor of safety against a slip along the surface ABC. (8 Marks)

d) If the slope described in (c) is unsafe, show, using clear sketches, how to protect this slope against failure. (4 Marks)

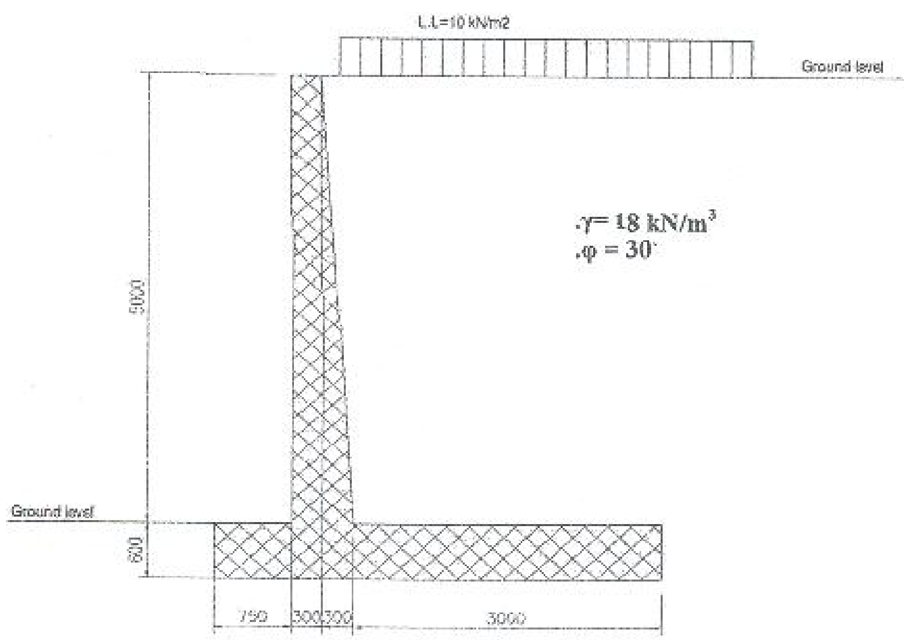


Fig. (1)

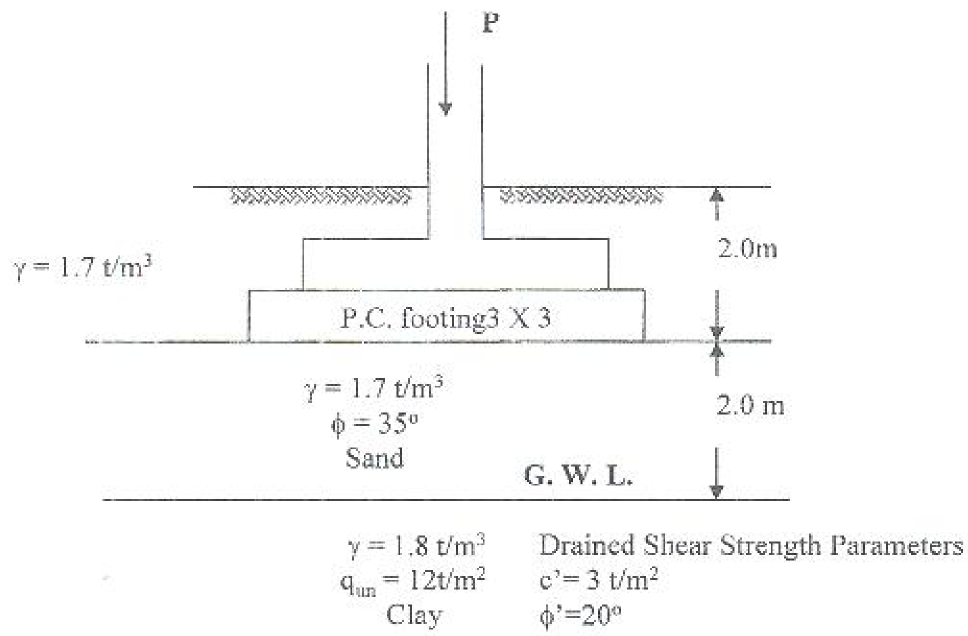


Fig. (2)

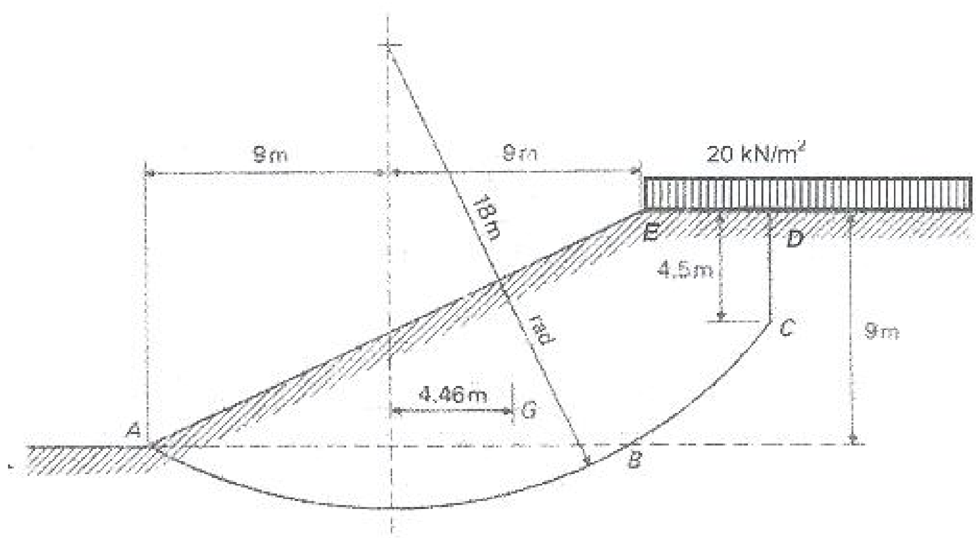


Fig. (3)

Best Wishes..........

Course Examination Committee

Tanta University

Department: Structural Engineering
Total Marks: 125 Marks

Faculty of Engineering

Course Title: Theory of structure	Course Code: CSE3109	Year: Third Year (هندسة مدنية - لائحة جديدة)
Date: January, 2010 (First term)	Allowed time: 4 hrs	No. of Pages: (2)

Remarks: (a .answer the following questions. - **b.** assume any missing data.)

1- Problem (1) 18 Marks:

Using the force method, draw the B.M.D. and S.F.D. for the statically indeterminate frame hinged at a and fixed at **b** given in **Fig. (1)**.

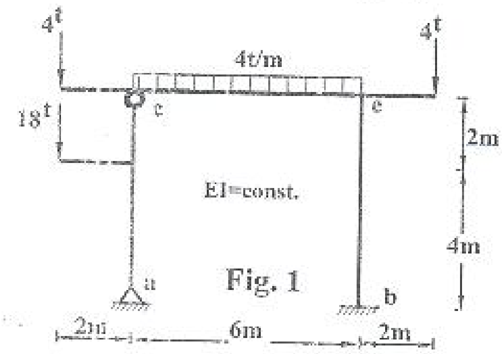


Fig. 1

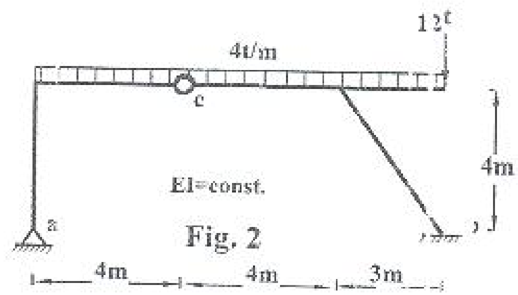


Fig. 2

2- Problem (2) 22 Marks:

For the statically indeterminate frame hinged at **a** and fixed at **b** given in **Fig.(2)**, draw the B.M.D due to the applied loads using the force method, also find the vertical deflection of the intermediate hinge c if EI= 10000 t.m^2 .

3- Problem (3) 18 Marks:

Using the slope-deflection method, draw the B.M.D. and S.F.D. for the given frame of variable I shown in **Fig. (3)**.

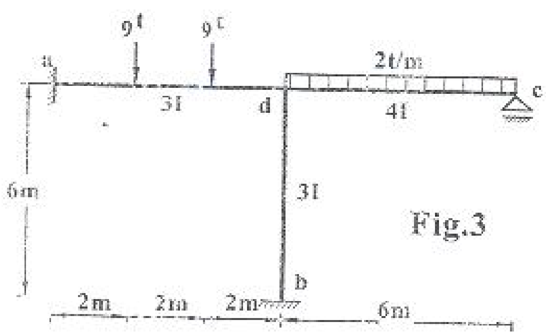


Fig.3

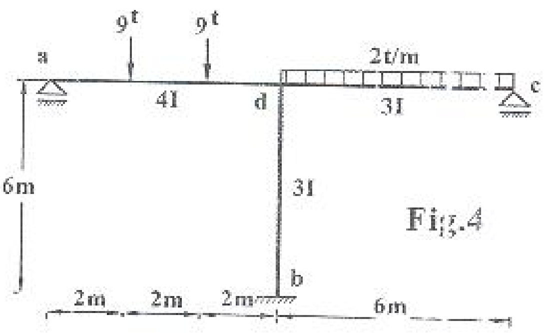


Fig.4

4- Problem (4) 20 Marks:

Using the slope deflection method, draw the B.M.D. for the given frame of variable I shown in **Fig. (4)**.

P.T.O.

5- Problem (5) 20 Marks:

Using the moment distribution method, draw the B.M.D. and S.F.D. for the given frame of constant I shown in Fig. (5).

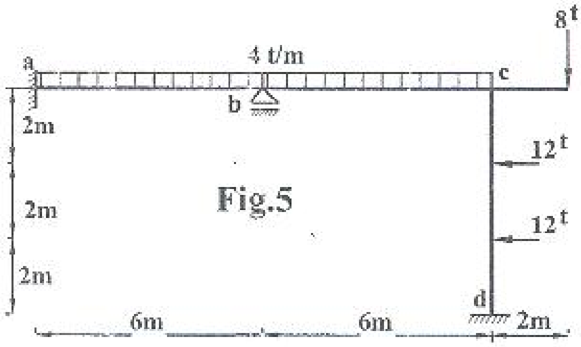


Fig.5

6- Problem (6) 22 Marks

a. Draw clear sketches for the mathematical models of free damped and free undamped one-degree of freedom system for dynamic analysis. **(5 Marks)**

b. Write the differential equation of undamped free body motion and solve this equation to find the undamped free vibration response (**u**) with initial displacement u_0 and velocity v_0. **(7 Marks)**

c. For the frame shown in **Fig. (6)**, **(10 Marks)**

i- Calculate the natural frequency considering the horizontal girder to be infinity rigid.

ii- If the initial displacement and the initial velocity are 2 cm and 40 cm/sec, respectively find displacement, velocity, and acceleration after 2 seconds. **($I = 0.04\ m^4$, $E = 200 t/cm^2$)**.

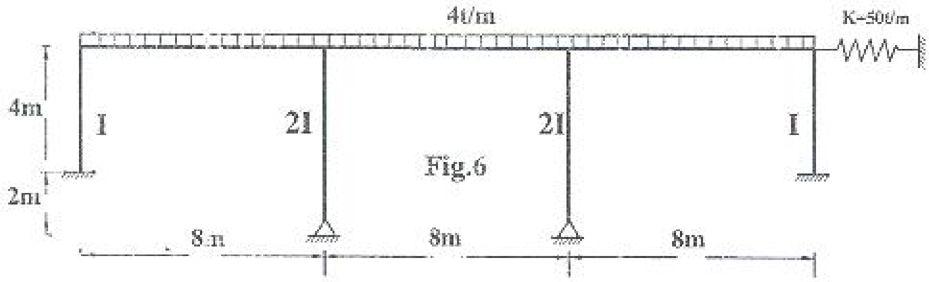


Fig.6

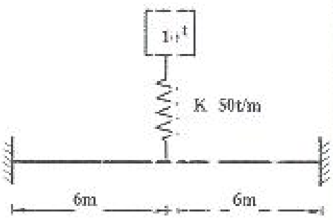


Fig.7

7- Problem (7) 10 Marks

For the structure shown in **Fig. (7)**, determine the equivalent spring constant Keq and the damping coefficient in the mathematical model. Assume the damping ratio = 10%, E = 200 t/cm^2, I = 0.06 m^4, and the stiffness of spring = 50 t/m.

With the best wishes

Course Examination Committee

Assist. Prof. Mohamed Abd Elkhalek Sakr & Assist. Prof. Tarek Mohamady

(Note: Any missing data can be reasonably assumed)
Answer the following questions:

QUESTION 1:

A. State one main difference between each of the following:
- gradually varied flow, rapidly varied flow;
- alternate water depths, conjugate depths;
- steady nonuniform flow, unsteady uniform flow;
- subcritical laminar flow, supercritical turbulent flow.

B. Drive the condition to have a triangular open channel of best-hydraulic section.

C. A uniform flow of 20 m^3/sec occurs in a rectangular channel of 5.0m width and 2.5m water depth. A smooth hump of height 0.5m is placed in the bottom of channel. Determine:
1. The difference in water levels before and after the hump.
2. The height of hump to produce critical depth on it, and the drop in water level.
3. Draw a relationship between y_1, y_2 versus Δz.

QUESTION 2:

A. List the main flow forces and define two flow dimensionless parameters discussing their major influence on open channel flow.

B. What does "The Tractive Force" mean?. Sketch the tractive force distribution along the wetted perimeter for a trapezoidal channel section.

C. A triangular channal whose top width is three times the depth, n=0.025, passes a discharge of 100 c.f.s. Find the critical depth and critical slope. If this discharge passes at depth of 1.0 ft, find the sequent depth if a hydraulic jump takes place.

QUESTION 3:

A. Discuss the behavior of the supercritical and subcritical flows in a horizontal , frictionless rectangular open channel having a horizontal transition.

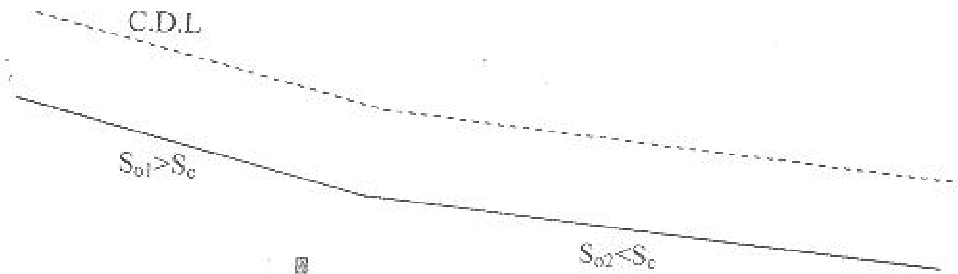
B. Prove that for wide rectangular channel, the dynamic equation of G.V.F may take the form: $\frac{dy}{dx} = S_o \frac{1-(y_n/y)^{10/3}}{1-(y_c/y)^3}$ if Manning's equation is used.

C. A sewer pipeline is laid on a slope 0.008. It is designed so that it will be partially full and will convey a flow of 400 liters/sec. The water area is 2/3 full pipe area. Determine the diameter of the sewer pipe line and the water depth.(take n= 0.013)

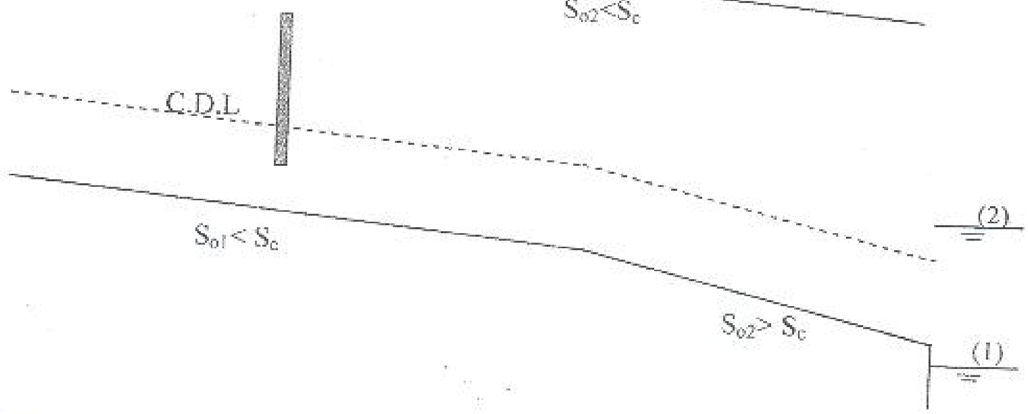
QUESTION 4:

A. Draw all the possible water profiles for the following open channels:

1-



2-



B. A long rectangular channel 6.0 m width, carries a discharge of 25 m^3/sec, bed slope 0.05 and Manning's coefficient n= 0.025.
At a certain section the channel bed slope is changed to 0.001. Sketch the water surface profile.

My Best Wishes
Dr. Shimaa Ghoraba and the committee

TANTA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF STRUCTURAL ENGINEERING
EXAMINATION (THIRD YEAR) STUDENTS OF CIVIL ENGINEERING هـ مستوى لائحة جديدة

COURSE TITLE: DESIGN OF REINFORCED CONCRETE STRUCTURES (2) a			COURSE CODE: CSE3110
DATE: January - 2010	TERM: FIRST	TOTAL ASSESSMENT MARKS: 85	TIME ALLOWED: 4 hours

Systematic arrangement of calculations and clear neat drawings are essential. Any missing data can be reasonably assumed. The exam consists of **FOUR** questions in two pages.

For all problems consider: f_{cu}= 40MPa, f_y= 400MPa for the main RFT

TRY ALL PROBLEMS

Problem # One (25Marks)

a. Define the statically determinate and statically indeterminate torsion, whose of them is more dangerous and why? **(2Marks)**

b. What is the action of the longitudinal bars in the torsion reinforcement? State the Code requirements for the stirrups and the longitudinal bars needed for the torsion reinforcement. **(3Marks)**

c. Compare between failure modes of a beam subjected to: **(flexure and shear)** or **(flexure, shear and torsion)** or **(torsion only)**. Whose of them is more dangerous and why? **(5Marks)**

d. Calculate the minimum stirrups for a beam cross-section 500×800mm subjected to shear and torsion. Consider the area of stirrups are equally for shear and torsion and $f_{y,stir}$= 360MPa. **(4Marks)**

e. Draw the B.M.D, S.F.D and T.M.D (if exist) for the main and secondary beams AB and CD shown in Figs.(1-a and 1-b) at critical cases (neglect the beam own weight), g= dead load, p= live load. **(6Marks)**

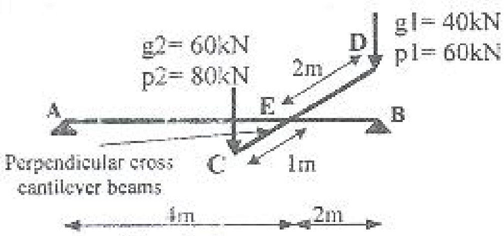


Fig. 1-a

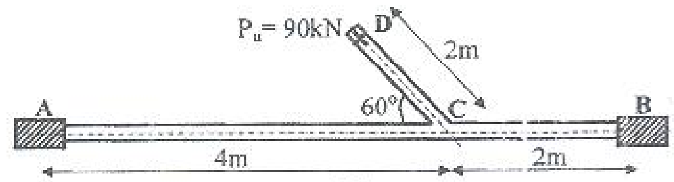


Fig. 1-b Plan

f. Figure 2 shows the critical section of a beam subjected to an ultimate torsional moment M_{tu}= 180kN.m. It is required to carry out the following:

i. Calculate the needed torsion reinforcement. **(3Marks)**

ii. Reinforcement details in cross section. **(2Marks)**

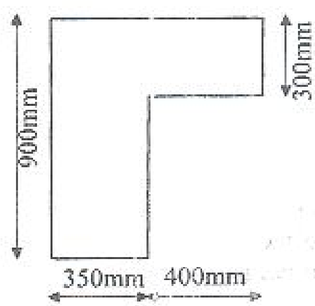


Fig. 2

Problem # Two (9Marks)

Figure 3 shows layout of a first floor of a building resting on eight columns with area of 12x14.4m. The panelled beams system is required to cover the floor using the beam modules shown in the figure. The slab is subjected to L.L= 6kN/m^2 and cover= 1.3kN/m^2. The slab thickness is 100mm. It is required to make a complete design (design + drawing details) of the panelled beam **B1** only. Determine the load carried by the supported beam **B2**.

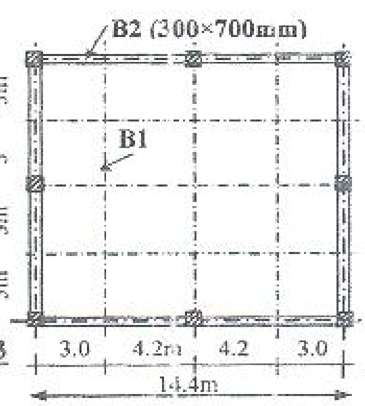


Fig. 3

Problem # Three (30Marks)

a. Compare between waffle and two-way ribbed slabs. **(2Marks)**

b. Why the depth of ribs in one-way ribbed slab systems is taken as beams, whereas the bending moment is taken as solid slabs? Why the ribbed slab system is not efficient in a cantilever slabs? **(3Marks)**

c. State the code requirements for a hollow-block slab systems regarding: geometry – cross ribs – concrete shear strength – reinforcement. **(3Marks)**

P.T.O

d. Figure 4 shows structural plan of a roof **ABCD** with cantilevers. The roof is rest on four beams that supported on four columns. The **hollow-block** slab system is required. The roof is subjected to L.L= 4kN/m^2 and flooring cover = 1.3kN/m^2. The cross-section of all beams is 250×700mm. It is required to carry out the following:

i- Draw B.M.D and S.F.D of critical strips. **(4Marks)**

ii- Design the slabs at critical sections. Calculate the width of solid part due to shear and moment. **(6Marks)**

iii- Draw to scale 1:50 the plan and needed cross sections showing the reinforcement details and arrangement of hollow blocks. **(5Marks)**

iv- Calculate the loads carried by the supporting beam **GFJ**. **(3Marks)**

v- Check the design of the slabs to carry a sand cone load apply on the panel **EFGD** without flooring cover. The diameter and the height of the sand cone load are 6 and 2m, respectively. The sand density is 18kN/m^3. **(4Marks)**

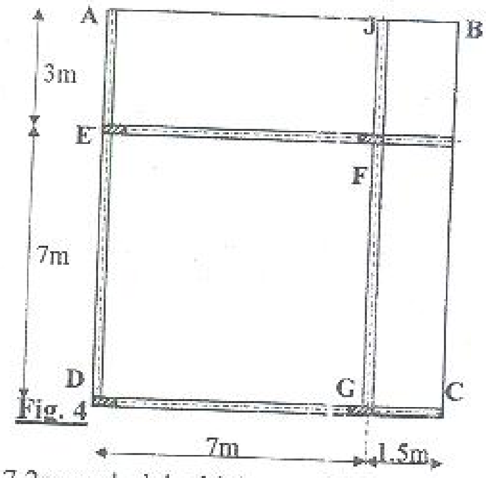


Fig. 4

Problem # Four (28Marks)

Figure 5 shows plan of a typical floor of RC flat slab with panel 7.2m×7.2m and slab thickness 0.25m (t_s= 240mm) without drop panel and with column head 1.60m×1.60m. The flat slab is resting on square columns 0.5mx0.5m. The marginal beams 0.3mx0.9m are used at the outer edges of the flat slab AB, AC, and BD. The edge CD is free without marginal beam. The flat slab is subjected to a uniformly live load 6kN/m^2 and cover flooring 1.5kN/m^2. Using the empirical method of the Egyptian code of practice for design of flat slab, it is required to carry out the following:

i- Determine the critical bending moment in column and field strips in X-direction only. **(5Marks)**

ii- Design the critical sections due to bending moment of strips in X-direction only. **(6Marks)**

iii- Check one-way and two-way shear stresses for the interior column C1 considering the case of the total loads only (dead and live loads). **(6Marks)**

iv- Draw on plan the reinforcement details of the column and field strips in X-direction only. Draw in cross section the reinforcement details of the column head. **(5Marks)**

v- Calculate the load acting on the marginal beam in y-direction and calculate Mu, Qu, and Mtu at critical sections. **(6Marks)**

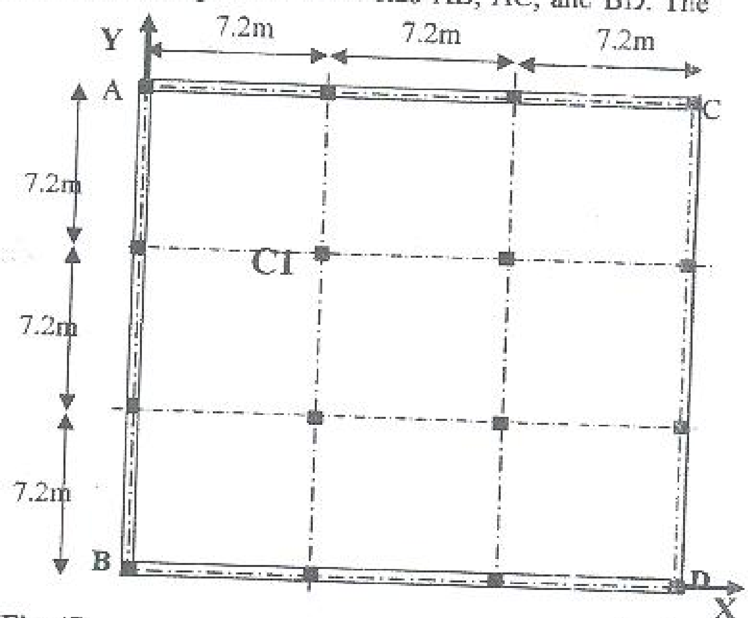


Fig. (5)

أطيب الأمنيات بالتوفيق

أ.د/ طارق فوزى الشافعى   أ.د/ محمد أحمد قاسم