Tanta University
Faculty of Engineering
Structural Engineering Department

Time Allowed: 3 hours
May 30, 2007
3rd Year Civil Engineering

Structural Analysis by Computers

Question I (25%)

Figure 1 show a symmetric plane truss subjected to a concentrated load. It is required to:

1. Use symmetry to simplify the shown truss.
2. Using the stiffness matrix method, determine the joint displacements, the reactions at the supports and the force in each member of the plane truss due to the given loads.

E = 2000 t/cm² for all members.
A = 10 cm² for all members.

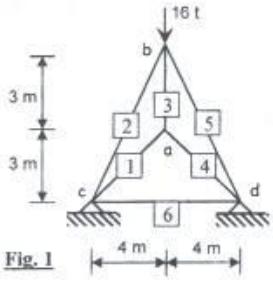


Fig. 1

Question II (25%)

For the beam shown in Fig. 2, carry out a complete stiffness analysis to draw the shearing force and bending moment diagrams.

For member ab: EI = 60 000 t.m².
For member bd: EI = 30 000 t.m².

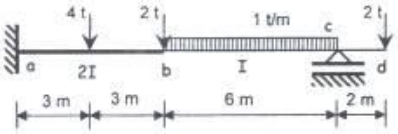


Fig. 2

Question III (25%)

Figure 3 shows a frame with an intermediate hinge at Joint d. It is required to:

1. Carry out a complete stiffness analysis to find the horizontal and vertical displacements of Joint d.
2. Draw the normal force, shearing force and bending moment diagrams.

EI = 3000 t.m² and EA = 15000 t for all members.

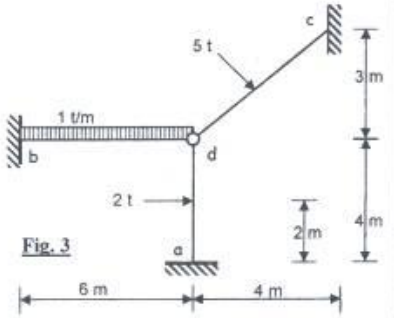


Fig. 3

Question IV (25 %)

The structure shown in Fig.4 consists of a frame and two link members. Using the stiffness method, find the nodal displacements and draw the shearing force and bending moment diagrams due to a temperature change of member 1-2-3 such that the temperature of the top surface T1=20 °C and the temperature of the bottom surface T2 = 60°C.

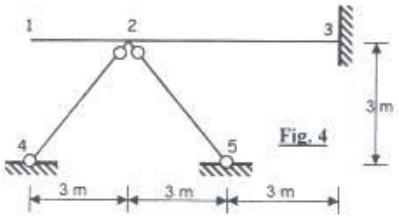


Fig. 4

For beam 1-2-3 EI = 6000 t.m^2 and EA = 15000 t.

For links 2-4 and 2-5 EA = 15000 t.

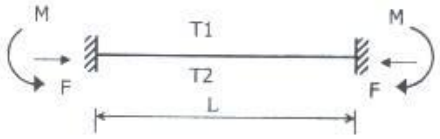
$\alpha = 10^{-5}/^{o}C$ and d = 0.8 m

Hint:

For a fixed-end beam subjected to a non-uniform temperature change:

$$M = EI\alpha\frac{(T2-T1)}{d}$$

$$F = EA\alpha\frac{(T1+T2)}{2}$$



Question V (15 %)

For the beam shown in Fig. 5, draw the bending moment and shearing force diagrams using the stiffness method if Support b settles vertically by 1 cm.

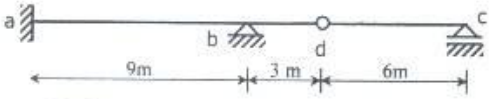


Fig. 5

EI = const. = 9000 t.m^2

The Global Stiffness Matrix of a Truss Element

$$K = \frac{EA}{L}\begin{bmatrix} c^2 & cs & -c^2 & -cs \\ cs & s^2 & -cs & -s^2 \\ -c^2 & -cs & c^2 & cs \\ -cs & -s^2 & cs & s^2 \end{bmatrix}$$

$c = \cos\theta \quad and \quad s = \sin\theta$

The Global Stiffness Matrix of a Fixed-Fixed Frame Element

$$K = \begin{bmatrix} a_1 & a_2 & -a_3 & -a_1 & -a_2 & -a_3 \\ & a_4 & a_5 & -a_2 & -a_4 & a_5 \\ & & a_6 & a_3 & -a_5 & a_6/2 \\ & & & a_1 & a_2 & a_3 \\ & & & & a_4 & -a_5 \\ & & & & & a_6 \end{bmatrix}$$

where

$$a_1 = (EA/L)\,c^2 + (12EI/L^3)\,s^2$$
$$a_2 = (EA/L - 12EI/L^3)\,cs$$
$$a_3 = (6EI/L^2)\,s$$
$$a_4 = (EA/L)\,s^2 + (12EI/L^3)\,c^2$$
$$a_5 = (6EI/L^2)\,c$$
$$a_6 = 4EI/L$$

$c = \cos\theta \quad and \quad s = \sin\theta$

The Global Stiffness Matrix for Fixed-Hinged Frame Element

$$K = \begin{bmatrix} a_1 & a_2 & -a_3 & -a_1 & -a_2 \\ & a_4 & a_5 & -a_2 & -a_4 \\ & & a_6 & a_3 & -a_5 \\ & & & a_1 & a_2 \\ & & & & a_4 \end{bmatrix}$$

where

$$a_1 = (EA/L)\,c^2 + (3EI/L^3)\,s^2$$
$$a_2 = (EA/L - 3EI/L^3)\,cs$$
$$a_3 = (3EI/L^2)\,s$$
$$a_4 = (EA/L)\,s^2 + (3EI/L^3)\,c^2$$
$$a_5 = (3EI/L^2)\,c$$
$$a_6 = 3EI/L$$

The Local Stiffness Matrix for a Fixed-hinged Beam Element

$$k = \begin{bmatrix} \frac{3EI}{L^3} & \frac{3EI}{L^2} & \frac{-3EI}{L^3} \\ \frac{3EI}{L^2} & \frac{3EI}{L} & \frac{-3EI}{L^2} \\ \frac{-3EI}{L^3} & \frac{-3EI}{L^2} & \frac{3EI}{L^3} \end{bmatrix}$$

The Local Stiffness Matrix for a Fixed-Fixed Beam Element

$$k = \begin{bmatrix} \frac{12EI}{L^3} & \frac{6EI}{L^2} & \frac{-12EI}{L^3} & \frac{6EI}{L^2} \\ \frac{6EI}{L^2} & \frac{4EI}{L} & \frac{-6EI}{L^2} & \frac{2EI}{L} \\ \frac{-12EI}{L^3} & \frac{-6EI}{L^2} & \frac{12EI}{L^3} & \frac{-6EI}{L^2} \\ \frac{6EI}{L^2} & \frac{2EI}{L} & \frac{-6EI}{L^2} & \frac{4EI}{L} \end{bmatrix}$$

جامعـــــة طنطـــــا
كليـــة الهندســـــة
قسم هندسة الأشغال العامة

مادة تخطيط النقل والسكك الحديدية
العام الجامعي ٢٠٠٦/٢٠٠٧
ثالثة - انشاءات

مسموح بدخول كتاب تخطيط النقل والسكك الحديدية فقط

أجب عن الأسئلة الآتية – الدرجة العظمى ٧٠ درجة

السؤال الأول (٢٥ درجة)

١. احسب توزيع الرحلات المستقبلية لأحدى المدن التي تتكون من أربعة مناطق نقلية اذا علم أن حجم الرحلات المتولدة في سنة الأساس موضحة بالجدول رقم (١) واجمالي عدد الرحلات المتولدة والمنجذبة الي المناطق سنة الهدف موضحة بالجدول رقم (٢).

وذلك باستخدام طريقة (Average Factor Method)

جدول رقم (١)

	١	٢	٣	٤
١	-	٤٠٠	٤٠٠	٣٠٠
٢	٣٠٠	-	٣٠٠	٣٠٠
٣	٤٠٠	٣٠٠	-	٦٠٠
٤	٣٠٠	١٠٠	٣٠٠	-

جدول رقم (٢)

Zone	١	٢	٣	٤
Trip Production	٢٠٠٠	١٥٠٠	١٦٠٠	١٨٠٠
Trip Attraction	١٥٠٠	١٨٠٠	٢٢٠٠	١٩٠٠

٢. احسب أقصي انحدار يمكن تطبيقة علي خط سكة حديد منحني نصف قطره ٦٣٠ متر اذا علم أن القطار بجوب الخط يتكون من قاطرة وزنها ١٢٠ طن وقدرتها ٢٠٠٠ حصان تجر خلفها ١٠ عربات ركاب وزن العربة ٥٠ طن وذلك بسرعة قصوي ٦٠ كم/ ساعة.

٣. تعطلت سيارة نقل محملة بالأحجار عند مرورها علي أحد المزلقانات فقام عامل البلوك بوضع كبسولة الخطر علي القضبان علي بعد ١٥٠ متر من موقع السيارة المعطلة لتحذير سائق القطار بوجود عائق علي الخط فاذا كانت سرعة قطار الركاب القادم ٩٠ كم/ساعة وعدد عرباتة ١٠ عربات ووزن العربة وهي محملة ٥٠ طن ووزن القاطرة ١٢٠ طن ومجموع القوي المسببة لايقاف القطار ف = ١٣٩٠٠٠ كجم والمطلوب التحقق عما اذا كان القطار سيصطدم بالسيارة المعطلة ام لا.

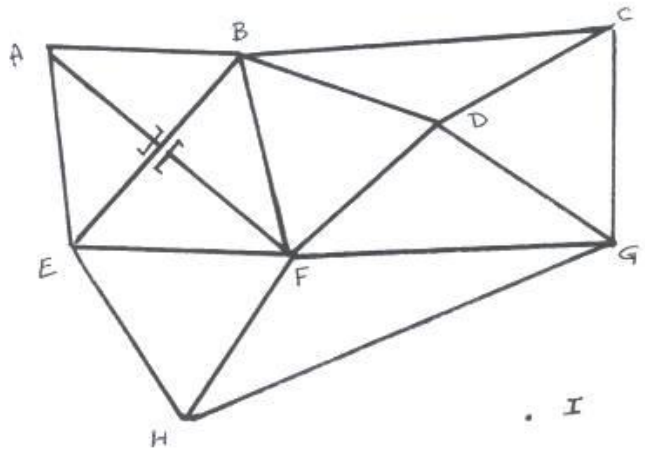
السؤال الثاني (٢٥ درجات)

١. احسب قيمة ارتفاع الظهر عن البطن العملي لخط سكة حديد منحني نصف قطرة ٨٠٠ متر والسرعة القصوى للمسير علي هذا الخط ١٢٠ كم / ساعة.

٢. لمح سائق قطار للركاب عائق علي خط السكة الحديد فقام بقرملة القطار وتوقف علي بعد ٥٠٠ متر من العائق المطلوب ايجاد المسافة بين القطار والعائق حال اكتشاف السائق للعائق علي الخط اذا علم ان سرعة القطار ٩٠ كم/ساعة ومكون من قاطره وزنها ١٢٠ طن قدرتها ٢٠٠٠ حصان وجميع محاورها مزودة بالفرامل تجر خلفها ١٠ عربات ووزن العربة وهي محملة ٥٠ طن ووزنها وهي فارغة ٤٠طن ويسير القطار علي خط منحدر لاسفل بمقدار ٢ % وعلي نصف قطره ٦٣٠ متر.

٣. اذا علم أن اتساع السكة في خط ملاهي يقدر ٦٢٠ مم وعرض تاج القضبان ٣٠ مم المطلوب ايجاد قيمة ارتفاع الظهر عن البطن الواجب تنفيذها علي هذا الخط اذا علم أن السرعة القصوي ٢٥ كم/ ساعة ونصف القطر ٤٠ متر.

٤. كون مصفوفة الحدث لشبكة النقل الموضحة



السؤال الثالث (٢٥ درجات)

١. احسب الاجهادات على عمق ٤٠ سم داخل قطاع التزليط عند ممرير قطار ركاب سرعتة ١٠٥ كم/ساعة ويتكون القطار من قاطرة وزنها ١٣٢ طن لها ٦ محاور تجر خلفها ١٠ عربات ركاب وزن العربة ٥٠ طن علما بأن الفلنكات المستخدمة فلنكات خشبية مقاس ٢٢ * ٢٥ * ١٧ سم

٢. يسير قطار على خط منحني مركب عكسي نصف قطر الأول ٨٠٠ متر والثاني ٦٠٠ متر والمطلوب ايجاد اقل مسافة بين مركزي المنحنيين اذا علم ان اقصي سرعة مصرح بالمسير بها ١٠٠ كم / ساعة.

٣. الشكل التالي يوضح القطاع الطولي لخط سكة حديد مزدوج والمطلوب ايجاد أكبر عدد من العربات التي توجد بقطار الركاب البضائع والتي تسير على هذا الخط بسرعة ١١٠ كم/ساعة & ٤٥ كم / ساعة على التوالي. فاذا علم أن قاطرات الديزل المستخدمة على هذا الخط وزنها ١٢٠ طن وقدرتها ٢٠٠٠ حصان وان وزن عربة الركاب ٤٥ طن ووزن عربة البضائع ٤٠ طن مع العلم بان قطارات البضائع مزودة بمبنسة وزنها ٢٥ طن.

مع أطيب التمنيات بالتوفيق والتفوق

دكتور : اسلام ابوالنجا

Dept.: Structural Engrg.	**Faculty:** Engineering	**University:** Tanta
Time allowed: 3 hr. **Date:** June 2007	**Course:** Design of steel structures (b)	**Course code:** CS3203

Note:
- It is allowed to use any tables or Egyptian Code of Practice books.
- Any missing data may be reasonably assumed.
- Attempt all questions. Max. Credit **100 %** only.
- Number of examination pages: **(3)**.

Question 01

i. Draw to sketch: Typical intermediate and end simple supports of crane track girder (give assumptions for the beam and support dimensions).
ii. Discuss with net sketches different elements of composite structures: slabs, beams, and columns.
iii. Distinguish with net sketches the different between rigid non-ductile connector and non-rigid ductile one.

The dimensions should be reasonably assumed and written. Net drawing will be appreciated. **(15 %)**

Question 02

Fig. (2) shows the statical system of a part of multi-pay building. According to the Egyptian Code of Practice, compute the effective buckling lengths for columns 1-2, 2-3, 4-5, 6-7 and 7-8. **(20 %)**

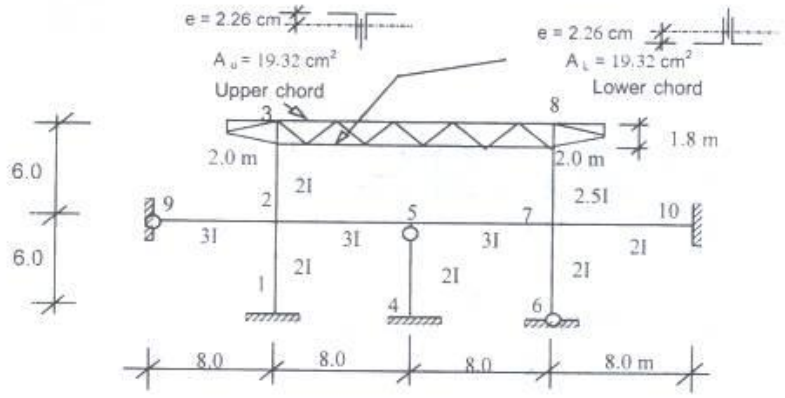


Fig. (2)

Question 03

a) Fig. (3-a) shows a staticl system of a steel frame and the given loads (dead load (g), live load (p) and wind load (w, w')), **with net sketches**, draw the different cases of loading.

- b) If the design moment is (**16 t.m**), normal force is (4.0 t) and the shear is (**20 t**) in the upper left connection of Fig. (3-a), design the connection **(shown in Fig. 3-b)** using the given data and design aids. ***Assume that the top flange connection resists the moment and the web connection resists the shear.***

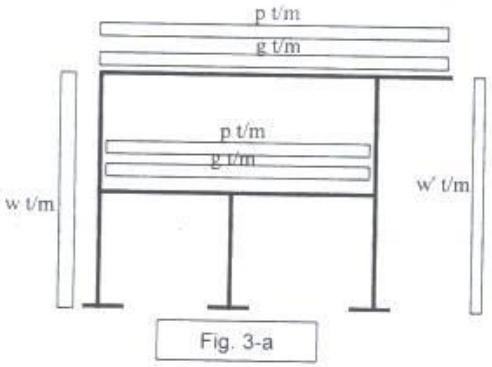


Fig. 3-a

Design aids:

- *The straining actions*
  N = 4 t (compression)
  Q = 20 t
  M = 16 t.m
- *Design of fillet welds between end plate and beam.*
- *Determine the number (n1) of 20 mm diameter H.S.B. (10.9), friction type*
- *Calculate the thickness of cover plate.*
- *Determine the number (n2) of 20 mm diameter H.S.B. (10.9) for web , friction type*

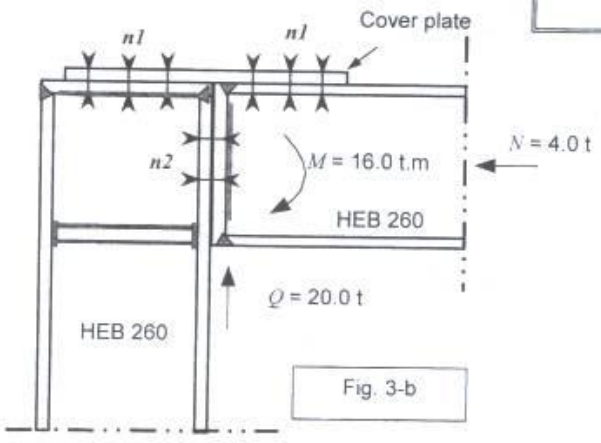


Fig. 3-b

(28 %)

Question 04

4.a. It is required to design the fixed- free column shown in Fig. (4), which represents a part of an industrial building. The column carries an axial load of **25 t**., in addition to an eccentric load of **12 t**, as shown. For simplicity, assume constant inertia for the design of the column.

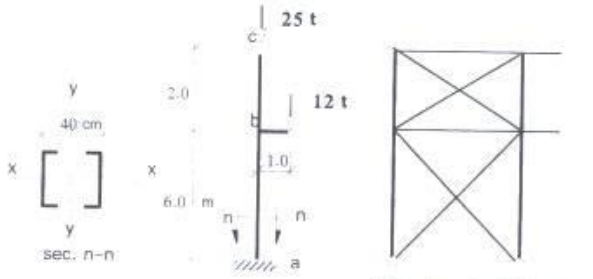


Fig. (4)

4. b. Design also the required fixed base subjected to the given loads.

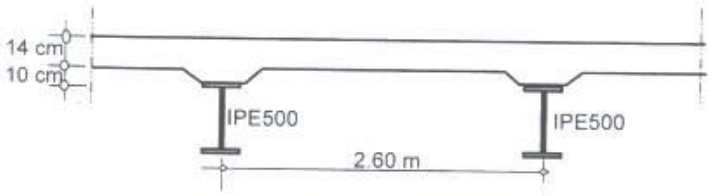
(30 %)

Question 05

A composite beams cover an area of 12.0 x 30.0 m². Each beam is simply supported with span of **12.0 m** and the spacing between beams is **2.6 m**. The **live load** is assumed to be 5 kN/m². The steel beam is chosen as **IPE 500** and the slab thickness is **14.0** cm with a haunch height of **10.0** cm. The interface between the concrete slab and the steel beam is assumed to be a full connection type using stud connectors. The construction type is **un - propped** one.

Check the actual stresses and deflection using: St44 ($f_{bt} = f_{bc}$ = 16 kN/cm²) and concrete grad C30 (Allowable compressive stress f_c is 1.05 kN/cm²).

(20 %)



With best wishes

Prof. Dr. ***Mohamed A. Dabaon***

جامعة طنطا	امتحان نهائى	الفرقة الثالثة انشاءات
كلية الهندسة	الفصل الدراسى الثانى	مادة التقارير الفنية
قسم الهندسة الانشائية	العام الجامعى 2006 / 2007	الزمن : ساعتان

أجب عن الأسئلة الآتية :

السؤال الأول:

مالفرق بين كل من الآتى بيانه مع الاستعانة بمثال واحد تطبيقى لكل (أذكر المصطلح العلمى باللغتين العربية والانجليزية فى كل الاحوال) :

1- تقرير هندسى – تقرير فنى & إدارة هندسية – هندسة إدارية.
2- مرفقات – ملحقات (لتقرير فنى).
3- تقريرفنى مرحلى – تقرير فنى ختامى.
4- جدوى اقتصادية – مستخلص ختامى.
5- دورة هيدرولوجية – دورة زراعية.
6- مخر سيول – هبوط تفاضلى لمنشأ.
7- المستنبطات – التوصيات (لتقرير فنى).
8- الصفات الاساسية لميكانيكا التربة – العناصر والمتغيرات الاساسية للتحليل الكيميائى لعينة مياه جوفية لجسة تربة عميقة نسبيا بمنطقة شمال الحسنية أقصى شمال شرق دلتا نهر النيل لانشاء محطة طلمبات.
9- انبعاج – التواء – انحناء – ترخيم.
10- تربة انهيارية – تربة انتفاشية – باجة.
11- عيوب انشائية ظاهرة – عيوب انشائية غير ظاهرة – عيوب انشائية غير ظاهرة ولها دلالات مباشرة.
12- S.P.T. & M.D.D. & O.M.C.

السؤال الثانى:

أ. ماهو المقصود بعمل جسة تربة لموقع ما لمنشأ معين؟ أذكر المعدات والاجهزة المستخدمة ، أهم عناصر ومتغيرات التقرير الفنى ، والعلاقات الترابطية بين هذه المتغيرات والمستنبطات المستفادة.

ب. ماهو المقصود " بدمك تربة إحلال " أذكر المعدات والأجهزة المستخدمة والأسلوب الأمثل لتنفيذ الدمك واختباراته بالشروط الفنية طبقا للمواصفات الهندسية ومايوصى به "الكود" الهندسى فى هذا الشأن.

ج. ماتعريف "شرخ" ولماذا يحدث؟ استعرض سبعة أنواع مختلفة مع ظروف كل. ثم تخير علاج لثلاثة منهم ، فى صورة تقرير فنى مسمى.

السؤال الثالث:

بين أهم العناصر الأساسية لتقرير فنى عن الحالات الآتية مع بيان الاحتياطات والتوصيات اللازمة لكل :
(يراعى فى جميع الاجابات : التركيز - الوضوح - والاختصار غير المخل)

1. جسات تربة (لتبيان قطاعات جيولوجية متكاملة) لازمة لمحطة طلمبات رفع وخلط بشمال قطاع الحسنية أقصى شمال شرق دلتا نهر النيل.
2. جسات تربة لمنطقة سهل الطينة شمال شبه جزيرة سيناء بغرض الاستصلاح ثم الاستزراع.
3. تربة إحلال بمنطقة جبل المقطم (شرق القاهرة الكبرى) لمشروع اسكانى متكامل وأبنية داخلية متعددة الاغراض وانشاء شبكة طرق داخلية والى المشروع. متى تتقرر تربة الاحلال؟ وضح ايضا الاسلوب الامثل لتنفيذ تربة احلال.
4. إنشاء مدينة صناعية مطلة على نهر ، وتتعرض المنطقة لرياح موسمية شديدة.
5. إنشاء مطار مزود بقرية بضائع على مشارف مدينة كبرى.
6. إنشاء أبراج متعددة الطوابق مطله على بحر متسع شمالا وتحتل مساحة كبيره شمال دلتا نهر ينبع من الجنوب ويصب مياهه الفائضة فى البحر ، المنطقة يلزمها كافة الخدمات.
7. إنشاء محطة طلمبات كبرى على مشارف بحيرة صناعية أمام "سد" وتحيط بها الصحراء من كل جانب والمنطقة تقع :
   - بمنطقة حارة قاحلة.
   - منطقة تتجمد فيها المياه.

لجنة الامتحان :
عنهم : أ.د. طلعت عويس

مع أطيب التمنيات

Tanta University
Faculty of Engineering
Structural Engineering Department

Time Allowed: 3 hours
June 2007
3rd Year Civil Engineering

Structural Analysis III

Solve as much as you can

Question I

Find the plastic section modulus Z_P and the plastic moment M_P for bending about an axis perpendicular to the web for the T-section shown in Fig. 1 for the following two cases:

a) The yield stress $\sigma_y = 250$ N/mm^2 in both tension and compression.
b) The yield stress $\sigma_y = 250$ N/mm^2 in tension and $\sigma_y = 350$ N/mm^2 in compression and the tip of web is in compression.

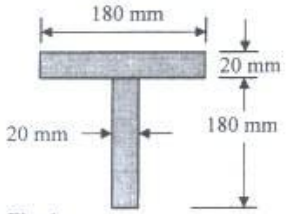


Fig. 1

Question II

Fig. 2 shows a two-span continuous beam ABC of different section and thus different plastic moment. Find the collapse load P_c and draw the collapse bending moment diagram.

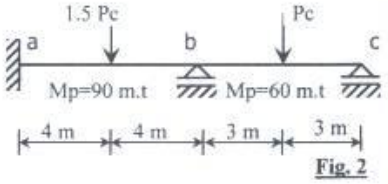


Fig. 2

Question III

Determine the critical collapse load P_c and draw the collapse bending moment diagram for the two-hinged portal frame shown in Fig. 3. The plastic moment M_P is constant for all members.

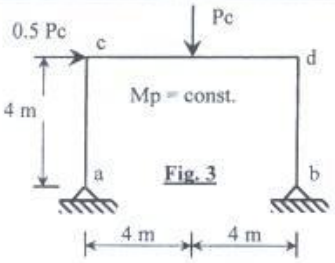


Fig. 3

Question IV

Construct the influence lines for Y_a, X_a, Y_b, F_{cd} and M_b for the continuous beam shown in Fig. 4. EI=const.

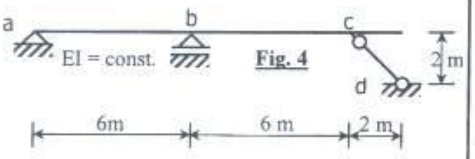


Fig. 4

Question V

Construct the influence lines for Y_a, X_a,M_a, Y_b, X_b, $N_{S\text{-}S}$, $Q_{S\text{-}S}$ and $M_{S\text{-}S}$ for the frame shown in Fig. 5. EI=const.

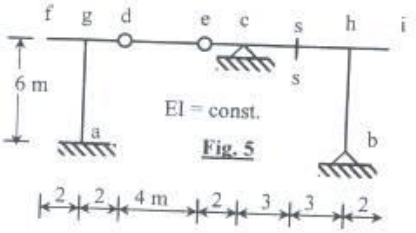


Fig. 5

Question VI

Using the **Moment Distribution Method**, draw the bending moment for the frame of variable moment of inertia shown in Fig. 6.

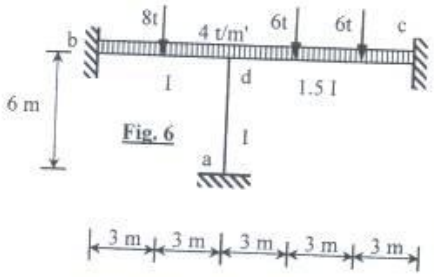


Fig. 6

Question VII

Using the **Moment Distribution Method**, draw the bending moment for the frame of variable moment of inertia shown in Fig. 7.

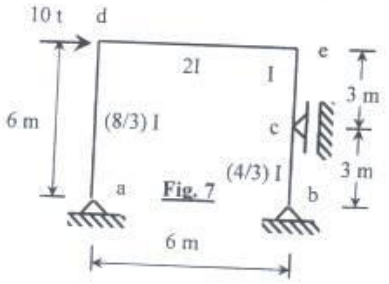


Fig. 7

With best wishes

Prof. Dr. Mohamed Kassem
Dr. Sherief Sharl Shukry

University of Tanta
Faculty of Engineering
Civil Engineering

Third Year

Final Exam
Design of Irrigation Works
May , 2007

Answer the following questions. (Any missing data can be reasonably assumed. Use neat proportional sketches in all your answers as much as you can.)

Question No 1:

A. Discuss how, why and for what purpose (s) the following water structures can be arranged in parallel or in series arrangements :
(a) weirs (b) regulators (c) dams and (d) navigation locks.

B. Demonstrate the role of the " water balance equation" for five different practical cases.

C. Discuss very briefly Five different types of each of the following, showing the main function (s) and design principles for each :
(a) piers (b) Escapes (c) Culverts (d) weirs (e) regulators (f) gates and (g) dams

Question No 2:

A. Define the following, giving one practical example for each :
(a) springing point, (b) free board, (c) pennstock, (d) main forces acting upon a dam
(e) submergency ratio (S.R.) and (f) free weir and submerged weir.
(g) what does "S.R." =0.0 and "S.R" = 1.0 mean?

B. Compare between the following :
(a) Symmetrical and unsymmetrical navigation locks.
(b) A syphon and a siphon.
(c) An equivalent irrigation water depth, and an equivalent precipitation depth.
(d) D.S. toe and U.S. toe of a water structure.
(e) The pulling force exerted by a lifting device of a regulator, and that upon a bollard of a navigation lock, compared to the load per pile of a R.S.J. Bridge.
(f) The line of resistance and the N.T.L.
(g) The safe core and the clayey core.
(h) The heading-up of a regulator and $\sum$ losses of a syphon.

Question No 3:

A. Select the main dimensions of a screw pile to carry a load P = 25 t , d = 30 cm , D= 1.0 m. If the safe stress at ground level = 1.0 Kg/cm^2, γ_e = 1.8 t/m^3, and $\varphi = 30^0$. Draw proportional sketch for the screw pile trestle and its connection with the super structure of the R.S.J. bridge, along with any selected details. List three reasons to decided constructing such a bridge.

B. Show the procedure for designing :
(i) a pier of a multi-vent regulator.
(ii) The thrust wall of an unsymmetrical navigation lock.

مع خالص أطيب الأمنيات

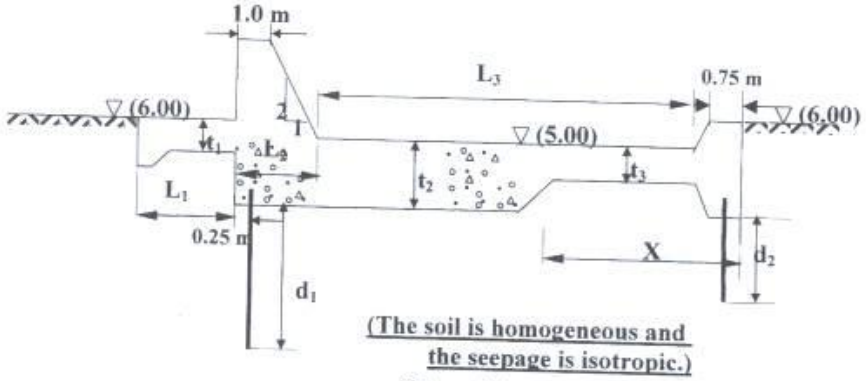
Question No 4:

For the shown Fayoum-type weir, it is required to do the following :

(i) Design the weir by determining all missing dimensions.
(ii) Calculate and draw the net-uplift diagram.
(iii) Show any necessary precautions to safe guard the structure against any excessive uplift and scouring activities expected.
(iv) Suggested a time-sheet to construct such structure.

Given :

(U.S.HWL. / D.S.HWL) = (12.00) / (8.50)
(U.S.LWL. / D.S.LWL) = (11.50) / (8.00)
Sill Level = (10.00)



(The soil is homogeneous and the seepage is isotropic.)

(The soil is silty sand.)

$\varphi = 30^0$

Exam. Committee
Prof. Dr. Talaat Owais & Exam. Committee.

Tanta University	**Foundation Engineering (1)**
Faculty of Engineering	**Second Term Exam 2006-2007**
Structural Eng. Department	**Third Year Civil**

- **Time allowed: 3 hours.**
- **Any missing data to be reasonably assumed.**
- **Tables are not allowed in the exam.**

Question No. 1

a) Suggest a program of a subsurface exploration for a construction site and a technical report for foundations.

b) What are the precautions to be considered in case of problematic soil sampling?

c) What is meant by the "S.P.T."? How to perform it? Discuss the expected results for both cohesive and cohesionless soil.

d) A sand cone test has been performed in a recently compacted fill. The test results were as follows:

Initial weight of sand cone apparatus + sand = 6300.0 gm
Final weight of sand cone apparatus + sand = 3400.0 gm
Weight of sand used in sand cone = 1514.0 gm
Weight of soil removed from test hole = 1910.0 gm.
The unit weight of the standard sand is 1.5 gm / cm^3
If the water content of the removed soil was 13%, calculate the field dry density.

Question No. 2

a) State three of the main conditions that must be satisfied by a foundation?

b) What are the main functions of semelles?

c) Using clear sketches show the different types of shallow foundations and discuss the conditions under which each type can be used.

d) Draw the different possible cases of the pressure distribution under an isolated footing subjected to a concentric load in addition to a moment about one axis. Outline how to calculate the intensity of soil pressure under the footing for each case.

e) Design a square footing to support a column 40×40 cm reinforced by 8Φ16mm and carries a load of 80 ton if the net allowable soil pressure is 1.5 kg/cm^2. Consider only the effect of both the bending moment and the punching stress in your calculations. Draw to scale 1:50 the details of reinforcements. The following data can be used: f_c=45 kg/cm^2, f_s=1400 kg/cm^2, q_p=8 kg/cm^2, k_1= 0.392, and k_2= 1248.

f) Design a raft foundation by the conventional method to support the columns shown in Fig. (1). All columns are 40×40 cm. the net allowable soil pressure is 0.50kg/cm^2. Take f_c=50 kg/cm^2, f_s=1400 kg/cm^2, q_{sh}=6 kg/cm^2, q_p=8 kg/cm^2, k_1= 0.361, and k_2= 1237. Draw to an appropriate scale the details of reinforcements.

Question No. 3

a) Discuss when there will be a need to use piles as a foundation system of a construction.

b) Differentiate between bored and driven piles. Give one example of each type showing the method of construction and then discuss the advantages and disadvantages of using bored piles?

c) Discuss, using clear sketches, what is meant by negative skin friction on piles?

d) What are the main conditions that must be satisfied in order to utilize the circulage method for designing a pile cap?

e) A square cap over a group of 9 piles, as shown in Fig. (2), has to support a column carrying a load (P) at the ground level. The piles are 0.35m in diameter spaced at 1.0m centre to centre. It is required to find
   - The maximum safe column load (P).
   - The settlement of the group, and compare it to the allowable settlement.

f) Design a pile cap subjected to a normal force of 140 ton and a double moment of 20.0t.m and 10.0t.m. as shown in Fig. (3). The column is 50×100 cm reinforced by 12Φ22mm. The piles are 40 cm diameter and spaced at 1.20 m centre to centre. Consider q_{sh}=6 kg/cm^2, q_p=8 kg/cm^2, q_b=10 kg/cm^2, k_1= 0.361, and k_2= 1237. Draw to an appropriate scale the details of reinforcements.

Best Wishes.....

Examiners: A. / Professor Mohamed A. Sakr & Dr. Ahmed Farouk A. K.

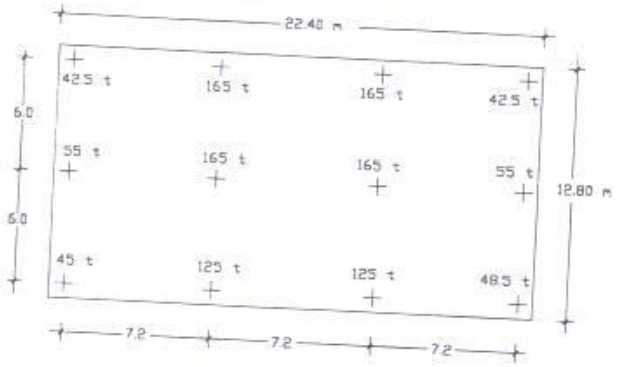


Fig. (1)

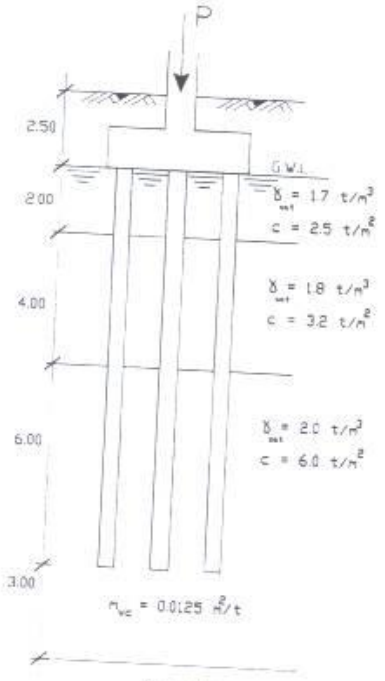
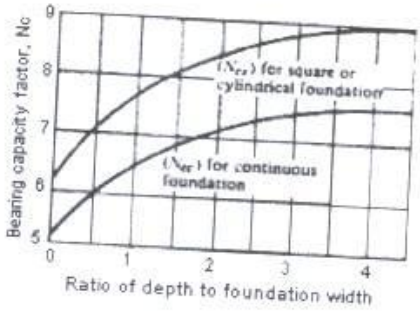


Fig. (2)



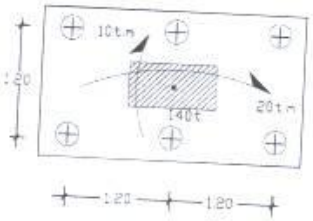


Fig. (3)

Tanta University | **Foundation Engineering (1)**
Faculty of Engineering | **Second Term Exam 2006-2007**
Structural Eng. Department | **Third Year Civil**

(External Students only)

- **Time allowed: 3 hours.**
- **Any missing data to be reasonably assumed.**
- **Tables are not allowed in the exam.**

Question No. 1

a) Mention the advantage and disadvantage of:
   1- Bored piles.
   2- Driven piles

b) A R.C. square column, shown in Fig (1) supports a load of 300 ton at ground level. Using a deep foundation, it is required to:
   1- Suggest the piles length.
   2- Calculate the bearing capacity of single pile.
   3- Calculate the numbers and arrangement of pile group.
   4- Design the cap over piles.
   5- Calculate the settlement.
   6- Draw section elevation and plan showing concrete dimension, reinforcement and arrangement of piles.
   Consider q_{sh}=6 kg/cm^2, q_p=8 kg/cm^2, q_b=10 kg/cm^2, k_1= 0.361, and k_2= 1237.

Question No. 2

a) State the different types of shallow foundations and show the conditions under which they can be used.

b) What are the types of failure of footings?

c) A strap foundation is suggested to support an exterior column of 70 ton with an interior column of 120 ton at ground surface, as shown in Fig. (2). The footings rest at a depth of 2.0 m below ground surface on a sand layer which has an allowable bearing capacity of 12.5 t/m^2. It is required to:
   1. Design the strap beam and the footings.
   2. Draw to an appropriate scale the details of reinforcements.
   Take f_c=50 kg/cm^2, f_s=1400 kg/cm^2, q_{sh}=6 kg/cm^2, q_p=8 kg/cm^2, k_1= 0.361, and k_2= 1237.

Question No. 3

a) Discuss when there will be a need to use piles as a foundation system of a construction.

b) What is meant by a negative skin friction pile?

c) Design a rectangular footing subjected to a vertical load of 60 ton as shown in Fig.(3).

The column dimensions are 60x40 cm and the allowable bearing capacity of soil is 10 t/m^2. Draw a section elevation and a plan showing the details of concrete dimensions and the reinforcement arrangements. Consider q_{sh}=6 kg/cm^2, q_p=8 kg/cm^2, q_b=10 kg/cm^2, k_1= 0.361, and k_2= 1237.

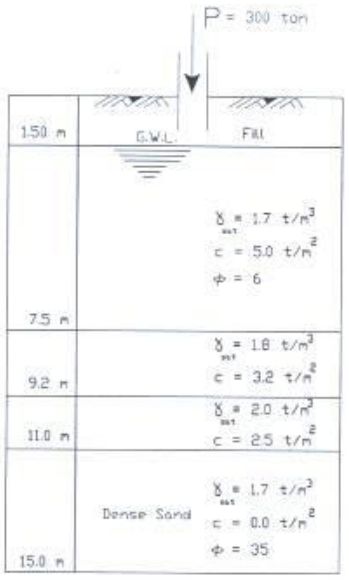


Fig. 1

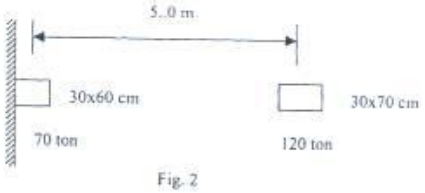


Fig. 2

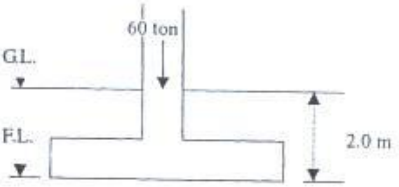


Fig. 3

Best Wishes.....

Examiners: A. / Professor Mohamed A. Saky & Dr. Ahmed Farouk A. K.

Tanta University
Faculty of Engineering
Structural Engineering Department

3rd year, Structural Eng. Dept.
2nd Term 2006 - 2007
Time Allowed: 3 Hrs

Design of Reinforced Concrete Structures (II)

Any data not given may be reasonably assumed. Concrete characteristic strength f_{cu} = 30MPa. Steel grade 360/520

الإمتحان مكون من ثلاث مسائل فى صفحتين

PROBLEM # ONE: (42% of maximum credit)

I- Fig. 1-a shows 2-hinged frame and Fig. 1-b shows 2-fixed frame. It is required, for the given loads, to carry out without calculations sketch the B.M.D and the corresponding main tension steel for the frames.

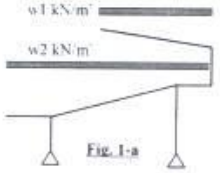


Fig. 1-a

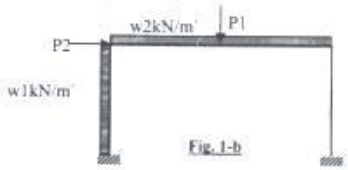
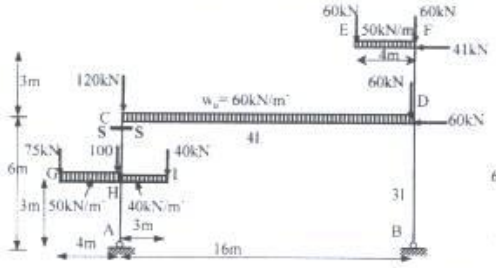


Fig. 1-b

II- Fig. 2 shows statically indeterminate frame ABCDEFGHI of a series of frames spaced 5m. The frame is hinged at A and B. It is required to make a complete ultimate design one of the intermediate frames having breadth 500mm and the depth of the beam CD is 1300mm (t_{CD} = 1300mm) and the parts EF and GH are 800mm (t_{EF}= t_{GH}= 800mm) and the slab thickness 120mm, for the given factorized (ultimate) loads including own weights. Given the negative B.M at section S-S is 2029kN.m (M_{S-S}= 2029kN.m) and the normal force at section S-S is compression and equals 710.5625kN (N_{S-S}= 710.5625kN). Determining the following:

a) B.M., S.F., and N.F. diagrams.
b) Design the critical sections and check shear stresses of the frame.
c) Draw to a convenient scale the intermediate frame showing clearly all concrete dimensions and reinforcement details in elevation and cross sections.



Statical system of the frame

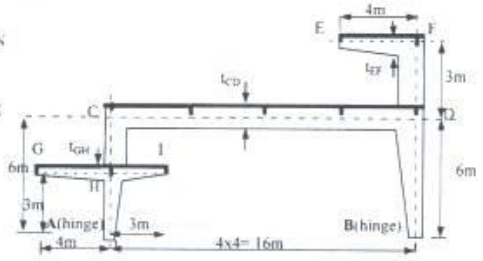


Fig. 2

PROBLEM # TWO (28% of maximum credit)

I- Fig.3 shows the layout of stair-case in plan. The allowed supports of stair slabs are semell and RC wall as shown figure. The landing carries half brick wall at its end as shown in section I-I. It is required to carry out the following:

a) Draw to reasonable scale concrete dimensions of stair slabs.
b) Complete design for stair slabs (design the critical strips + drawing the reinforcement details). Consider that L.L= 5kN/m^2.

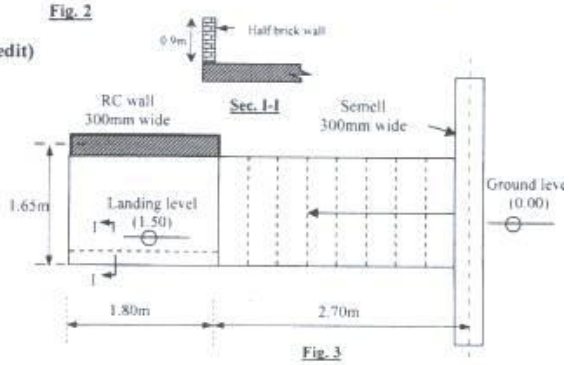


Fig. 3

Please Turn Over ⟶

II. Fig. 4 shows a Vierendeel girder of span 30m. It is required to carry out the following:
Draw the B.M.D, S.F.D and N.F.D diagrams of the Vierendeel girder under the given loads. Draw the shape of reinforcement of part marked (**A**). What are the assumptions must be considered to solve the Vierendeel by using the empirical method.

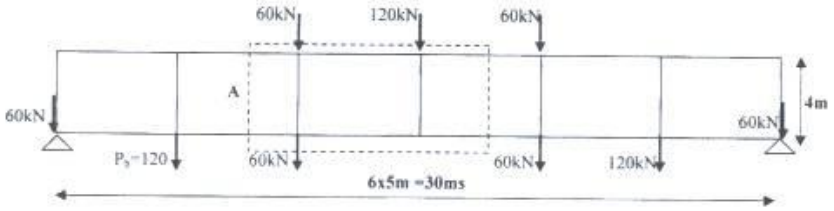


Fig. 4

PROBLEM # THREE (45% of maximum credit)

Fig.5 shows a general layout of an industrial area in plan and sectional elevation. The area consists of two halls; hall **A** of area (15x45m) and halls **B** of area (25x30m). The clear height of halls is 6m. A north light roof system is required for hall **B** only, whereas, a bottom floor is required for hall **A**. The columns are allowed only on the outer perimeter for halls as shown in plan.

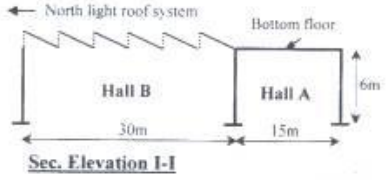
Required:

a- When the main supporting elements become more efficiency? What are the advantages of a saw-tooth roof structure and how ensure these advantages?

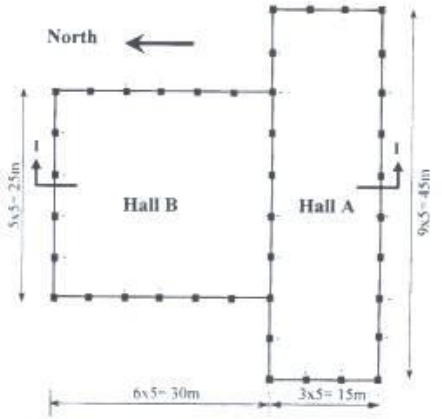
b- Suggest the more efficiency main supporting elements for halls. Draw to a convenient scale structural plan and sectional elevation I-I, showing the concrete dimensions of all structural elements of the suggested systems for each hall of the industrial area. Locate and name the needed joints on plan. Illustrate the joint details in elevation.

c- Using diagrammatic sketches show the load transfer from the roof to foundation for halls "without any calculations". What is the effect of post inclination on the analysis of load transfer to the foundation?

d- Complete design (design = drawing the reinforcement details) for the suggested main supporting elements and its components for the halls, **if the total ultimate dead and live loads (g and p) of the roof are 10 and 6kN/m^2** , respectively, not included own weight of the main supporting element.



Sec. Elevation I-I



Plan

Fig. 5

مع أطيب الأمنيات

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

Dept.: Structural Engrg.	**Faculty:** Engineering	**University:** Tanta
Time allowed: 3 hr. **Date:** June 2007	**Course:** Design of steel structures (b)	**Course code:** CS3203

Note:
- It is allowed to use any tables or Egyptian Code of Practice books.
- Any missing data may be reasonably assumed.
- Attempt all questions. Max. Credit **100 %** only.
- Number of examination pages: (**3**).

Question 01

i. Draw to sketch: Typical intermediate and end simple supports of crane track girder (give assumptions for the beam and support dimensions).
ii. Discuss with net sketches different elements of composite structures: slabs, beams, and columns.
iii. Distinguish with net sketches the different between rigid non-ductile connector and non-rigid ductile one.

The dimensions should be reasonably assumed and written. Net drawing will be appreciated. **(15 %)**

Question 02

Fig. (2) shows the statical system of a part of multi-pay building. According to the Egyptian Code of Practice, compute the effective buckling lengths for columns 1-2, 2-3, 4-5, 6-7 and 7-8. **(20 %)**

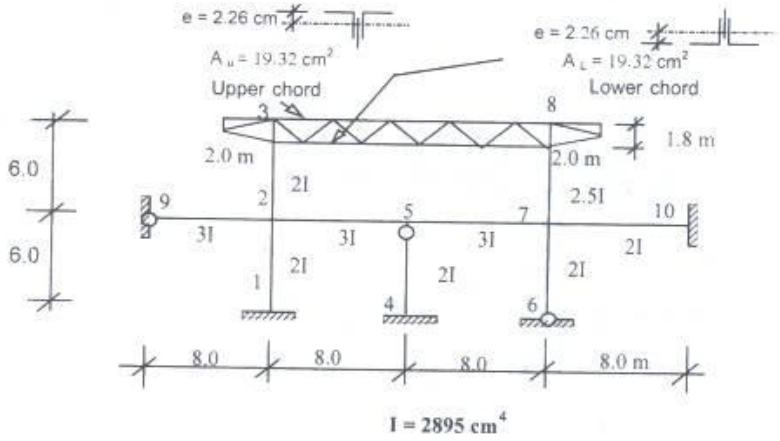


Fig. (2)

Question 03

a) Fig. (3-a) shows a staticl system of a steel frame and the given loads (dead load (g), live load (p) and wind load (w, w')), **with net sketches**, draw the different cases of loading.

- b) If the design moment is (**16 t.m**), normal force is (4.0 t) and the shear is (**20 t**) in the upper left connection of Fig. (3-a), design the connection **(shown in Fig. 3-b)** using the given data and design aids. ***Assume that the top flange connection resists the moment and the web connection resists the shear.***

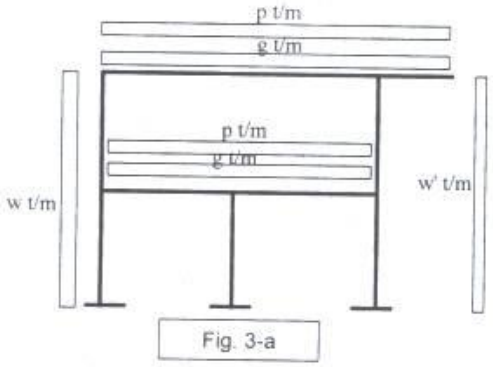


Fig. 3-a

Design aids:

- *The straining actions*
  N = 4 t (compression)
  Q = 20 t
  M = 16 t.m
- *Design of fillet welds between end plate and beam.*
- *Determine the number (n1) of 20 mm diameter H.S.B. (10.9), friction type*
- *Calculate the thickness of cover plate.*
- *Determine the number (n2) of 20 mm diameter H.S.B. (10.9) for web , friction type.*

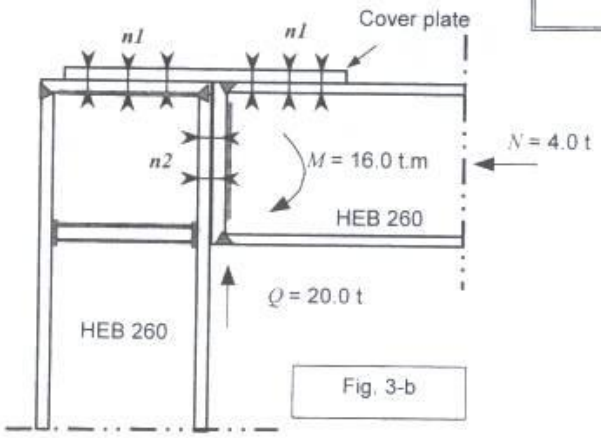


Fig. 3-b

(28 %)

Question 04

4.a. It is required to design the fixed- free column shown in Fig. (4), which represents a part of an industrial building. The column carries an axial load of **25 t**., in addition to an eccentric load of **12 t**, as shown. For simplicity, assume constant inertia for the design of the column.

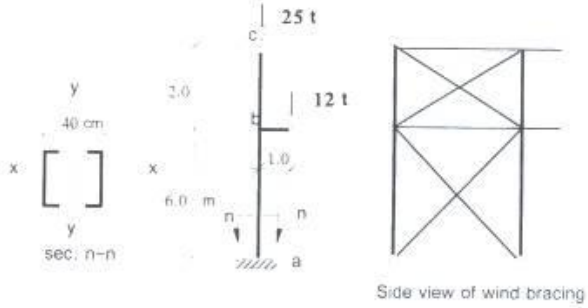


Fig. (4)

4. b. Design also the required fixed base subjected to the given loads.

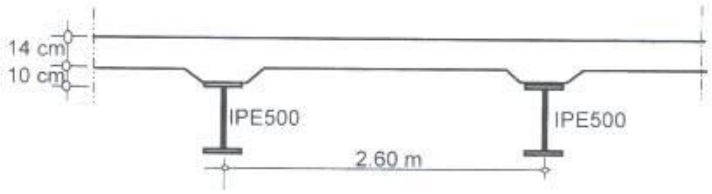
(30 %)

Question 05

A composite beams cover an area of 12.0 x 30.0 m². Each beam is simply supported with span of **12.0 m** and the spacing between beams is **2.6 m**. The **live load** is assumed to be 5 kN/m². The steel beam is chosen as **IPE 500** and the slab thickness is **14.0** cm with a haunch height of **10.0** cm. The interface between the concrete slab and the steel beam is assumed to be a full connection type using stud connectors. The construction type is **un - propped** one.

Check the actual stresses and deflection using: St44 ($f_{bt} = f_{bc}$ = 16 kN/cm²) and concrete grad C30 (Allowable compressive stress f_c is 1.05 kN/cm²).

(20 %)



With best wishes

Prof. Dr. ***Mohamed A. Dabaon***