TANTA UNIVERSITY | STRUCTURAL ENGINEERING DEPARTMENT | FACULTY OF ENGINNERIN

Structural Analysis by Computers — **Course Code: CS3204**

Third Year 2010-2011 — **June 2011 (Second Term)**

Allowed time: 3 hrs — **Total Marks: 70 Marks** — **No. of Pages: (2)**

Question I (20 Marks)

a. Using the simple theory of elasticity (direct method), derive the stiffness matrix of a typical plane frame element in the local system.

b. Using the stiffness matrix method, determine the joint displacements, the reactions at the supports and the force in each member of the plane truss shown in Figure 1 due to the given loads. EA/L = 200 t/cm for all members.

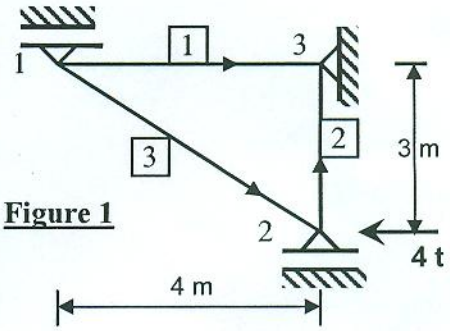


Figure 1

Question II (15 Marks)

For the frame shown in Fig. 2 subjected to concentrated loads (EI = 3000 t.m^2 and EA = 15000 t for all members), It is required to:

1. Use symmetry to simplify the shown frame.
2. Using the stiffness matrix method, draw the bending moment diagram of the frame.

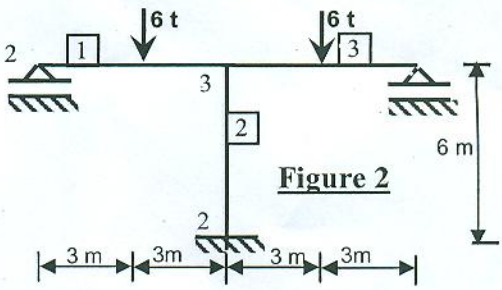


Figure 2

Question III (20 Marks)

Figure 3 shows a plane frame fixed at Joint a and b. It is required to:

Carry out a complete stiffness analysis to find the all deformations of Joint c.

Draw the normal force, shearing force and bending moment diagrams.

EI = 3000 t.m^2 and EA = 15000 t for all members.

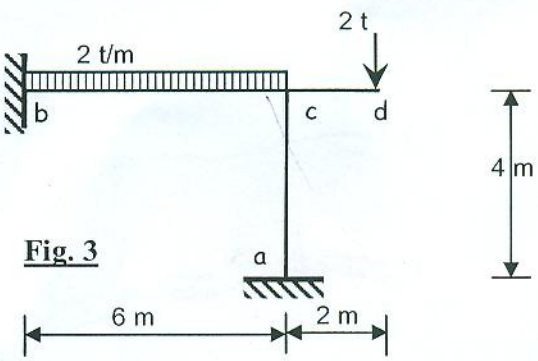


Fig. 3

Question No 3: (30 degrees)

Canal crossing a drain with the following data

	Canal	Drain
Discharge	6.0 m^3/sec.	20.0 m^3/sec.
Water level	(8.00)	(5.00)
Bed level	(6.00)	(3.00)
Bed width	2.0 m	10.0 m
Road level	(10.00)	(10.00)
Road width	8.0 m	8.0 m
Land level	(8.50)	(8.50)
Side slope	2 :1	2 :1

It is required to :

1. **Check the head loss due to R.C. Box aqueduct.**
2. **Give complete design the aqueduct and culvert parts.**
3. **Draw neat sketch sec. elevation of the aqueduct.**

For Soil

$\gamma_{soil} = 1.65\ t/m^3$

$K_a = 0.3$

For Screen

$t = 2.5\ cm$ $S = 15.0\ cm$ $Ks = 2.0$ $\theta = 60^\circ$

انتهت الاسئلة

مع أطيب التمنيات بالتوفيق د / ابراهيم محمد حسين رشوان واللجنة

جامعة طنطا – كلية الهندسة | إسم المقرر: تصميم اعمال الرى | الفرقة الثالثة (انشاءات - لائحة قديمة)
العام الجامعى: ٢٠١٠/٢٠١١ | الفصل الدراسى الثانى | النهاية العظمى: ٧٠ درجة
زمن الإمتحان: ثلاث ساعات | امتحان نهاية الفصل الدراسى الثانى | الامتحان فى صفحة

(N.B.: Any missing data can be reasonably assumed.)

Question No 1: **(٢٥ degrees)**

A. **Mention and explain the function of the hydraulic structures.**
B. **Define with drawing neat sketches the flow net exists below a weir floor due to water head difference.**
C. **Explain using net sketches how to calculate the velocity and discharge of seepage flow.**
D. **Explain cases of loading of the hydraulic structures.**
E. **Define the main types of retaining walls according to materials, site and design.**
F. **Show how check the stability of the pier.**
G. **Show how check the stability and design of the R.C. cantilever wall.**
H. **What are the main types of escapes?**

Question No 2: (25 degrees)

A main canal crossing a drain with the following data

	A main canal	Drain
Discharge	20.0 m^3/sec.	12 m^3/sec.
Water level	(8.00)	(5.75)
Bed level	(6.00)	(4.25)
Bed width	8.0 m	6.0 m
Road level	(10.00)	(10.00)
Road width	10.0 m	8.0 m
Land level	(8.50)	(8.50)
Side slope	2 :1	2 :1

It is required to :

1. Check the head loss due to syphon.
2. Design the syphon and culvert parts of a syphon.
3. Draw neat sketch sec. elevation of the syphon.

Question No 3: (25 degrees)

R.C. slab bridge need to be constructed at the drain with width 8.0 m and tow side walks 1.5 m each.

1. **Show the hydraulic design of the bridge**
2. **Show the complete structural design of the all parts of bridg with neat sketches for steel details**
3. **Draw neat sketch sec. elevation of the bridge.**

For Soil $\gamma_{soil} = 1.65\ t/m^3$ $K_a = 0.3$

For Screen $t = 2.5$ cm $S = 15.0$ cm $Ks = 2.0$ $\theta = 60^\circ$

انتهت الاسئلة

مع أطيب التمنيات بالتوفيق د / ابراهيم محمد حسين رضوان واللجنة

V- Fig. 3 shows a Vierendeel girder of span 25m. It is required to carry out the following: Draw the B.M.D, S.F.D and N.F.D diagrams of the V.G under the given loads. Draw the reinforcement details of the part marked (A). **(8 marks)**

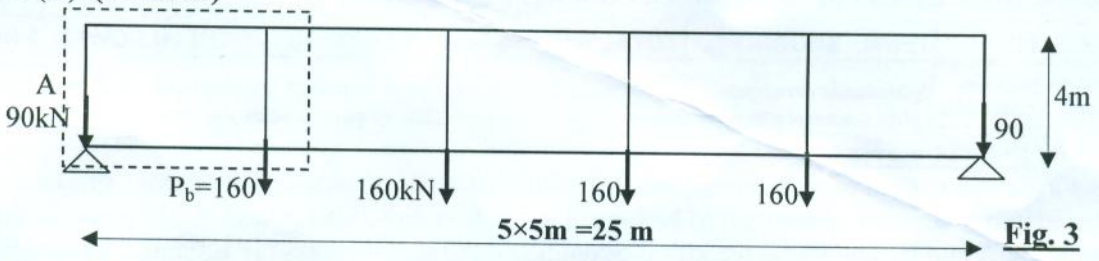


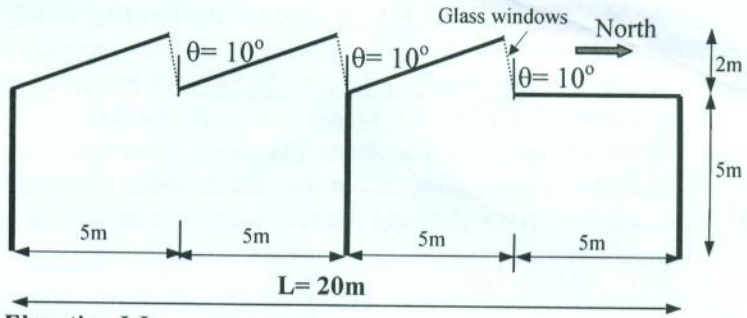
Fig. 3

PROBLEM # THREE (32 marks)

I. Fig. 4 shows a saw – tooth roof structures. The columns shown in figure are only allowed. A uniform stresses under a footings is required. It is required to carry out the following:

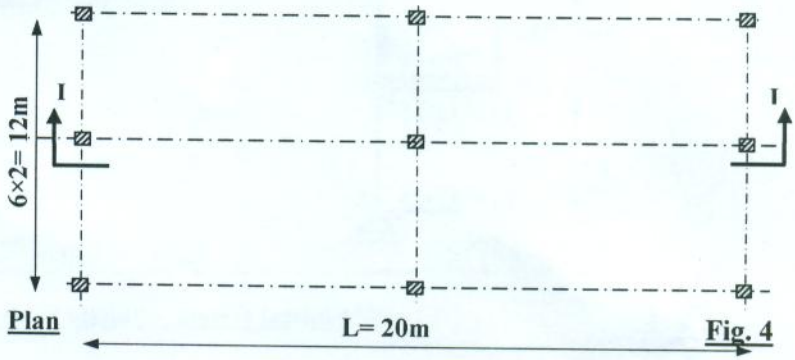
a) Draw to convenient scale, sectional elevation showing all necessary structural elements and its concrete dimensions. **(5 marks)**

b) Using diagrammatic sketches show the statical actions of all structural elements "without any calculations". **(5 marks)**



Sec. Elevation I-I

II. Fig. (5) shows a plan of an industrial hall **(32×50m).** The columns are allowed only in the outer perimeter of the hall. The roof is in different levels as shown in sections I-I and II-II as shown in the figure. The spacing between the main supporting elements **(MSE)** is **5m**. It is required to carry out the following:



Plan

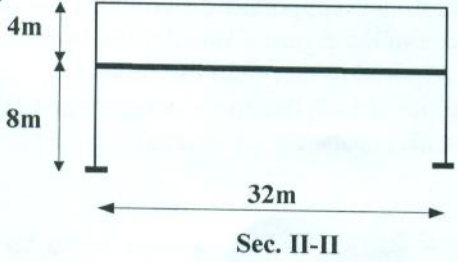
Fig. 4

a. Suggest the systems of more economical **MSE** and for the roof slabs. Draw to convenient scale the section II-II and part of plan showing the concrete dimensions of all structural elements. **(7 marks)**

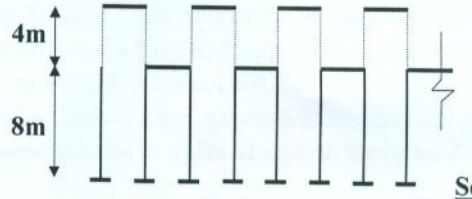
b. Calculate the total ultimate loads carried by the **MSE** of the hall if the average ultimate dead and live loads, (g_u and p_u) of the roof slab are 12kN/m^2 and 5kN/m^2, respectively. The weight of the MSE may be estimated. **(4 marks)**

c. Design the **MSE** of the hall and its elements. **(6 marks)**

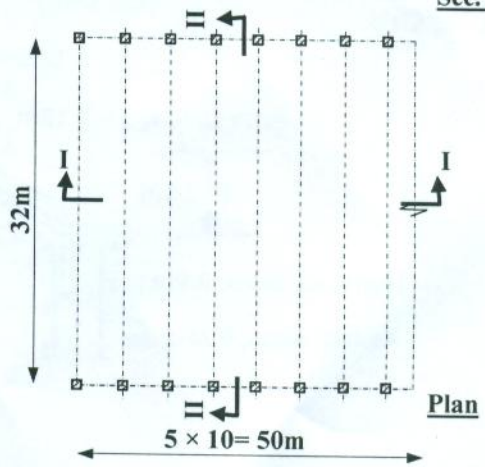
d. Draw to convenient scale the section II-II of the **MSE** showing the reinforcement details of the MSE and its elements. **(5 marks)**



Sec. II-II



Sec. I-I



Plan

Fig. 5

مع أطيب الأمنيات بالتوفيق

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

TANTA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF STRUCTURAL ENGINEERING ٣ هـ إنشاءات لائحة قديمة
EXAMINATION (THIRD YEAR) STUDENTS OF CIVIL AND STRUCTURAL ENGINEERING

COURSE TITLE: DESIGN OF REINFORCED CONCRETE STRUCTURES (2)		COURSE CODE: CS 3202
DATE: 11-JUNE-2011	TERM: SECOND	TOTAL ASSESSMENT MARKS: 70	TIME ALLOWED: 3 HOURS

For all problems consider that: f_{cu}=30MPa, St.360/520

Systematic arrangement of calculations and clear neat drawings are essential. Any data not given is to be assumed – Answer as many questions as you can

الإمتحان مكون من 3 أسئلة فى صفحتين

PROBLEM # ONE (24 marks)

Fig. 1 shows a statical system of an intermediate frame AFCDGBEH of series of the frames spaced 5m. The frame is statically indeterminate and considered to be braced in the two directions in-and-out of plane of the frame. The frame is hinged at A and B. The frame breadth is 500mm and the slab thickness is 120mm. The concrete section of the **girder CD is 0.5 × 1.2m** and for the **cantilever EF or GH at a maximum depth is 0.5 × 1.0m**. For the sake of the simplicity the concentrated loads are considered as a uniform loads. The horizontal reactions at hinges A and B are **XA= 42kN and X_B= 130.5kN** for the given **ultimate loads**. It is required to carry out the following:

a) Draw the B.M.D, S.F.D and N.F.D. **(8 marks)**

b) Design the critical sections and check shear stresses of the frame. **(8 marks)**

c) Draw to convenient scale the intermediate frame showing clearly the concrete dimensions in elevation and in cross sections showing the reinforcement details. **(8 marks)**

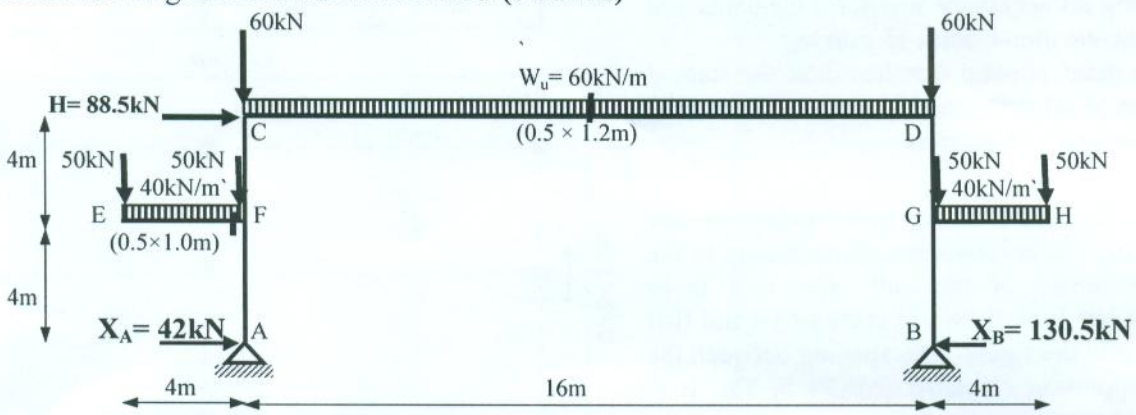


Fig. 1 **Statical system, ultimate loads and horizontal reactions**

PROBLEM # TWO (20 marks)

I- State the advantages and disadvantages of the tension structure. Explain the load transfer of the suspension bridges. **(3 marks)**

II- Why the horizontal reaction of the three hinged arch is increased by 5% than that of the two hinged arch? **(1 mark)**

III- Why the spacing between the windows centerlines of the saw – tooth roof structures shouldn't exceeds than 10m. **(1mark)**

IV- Fig. 2 shows a sectional elevation of an arched slab supported on columns spaced, S= 5m. The concrete dimensions of the arched slab elements are given in the figure. Consider the following loads of the slab: dead load, g= 5kN/m^2, live load, p= 1.5kN/m^2. It is required to carry out the following:

a- Calculate the column load including the additional load due to tie, hangers and stiffener. **(4 marks)**

b- Complete design (design + reinforcement details) of the tie. **(3 marks)**

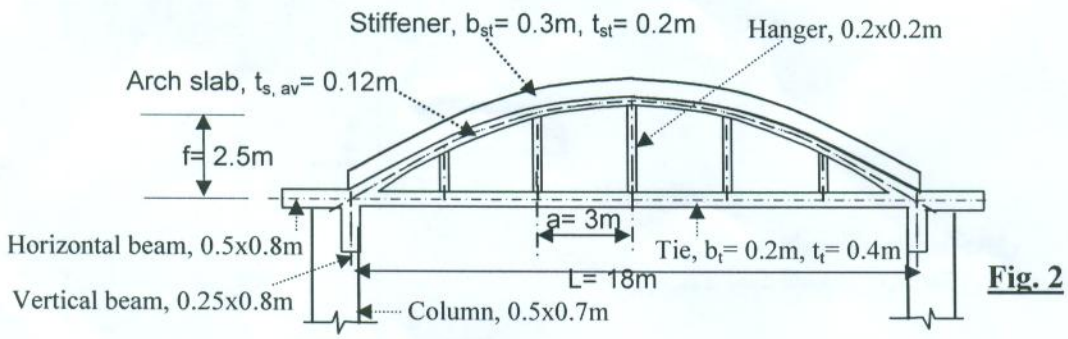


Fig. 2

Please Turn Over ⟶

Question 2:

a. Design the beam column (a-c) of the frame shown in Fig. (2). The straining actions, **neglecting the effect of wind** loads, are as follows:
- At section (a) $M_u = 0$, $P_u = 15$ t compression, and $Q_u = 4.0$ t
- At section (c) $M_u = 30$ t.m $P_u = 15$ t compression, and $Q_u = 4.0$ t

- To calculate the effective buckling length, use the end relative stiffness of the columns as: $\underline{G_a = \text{for (hinge)}}$ and $\underline{G_b = 1.85}$.

- Try cross section of the column HEB300mm.

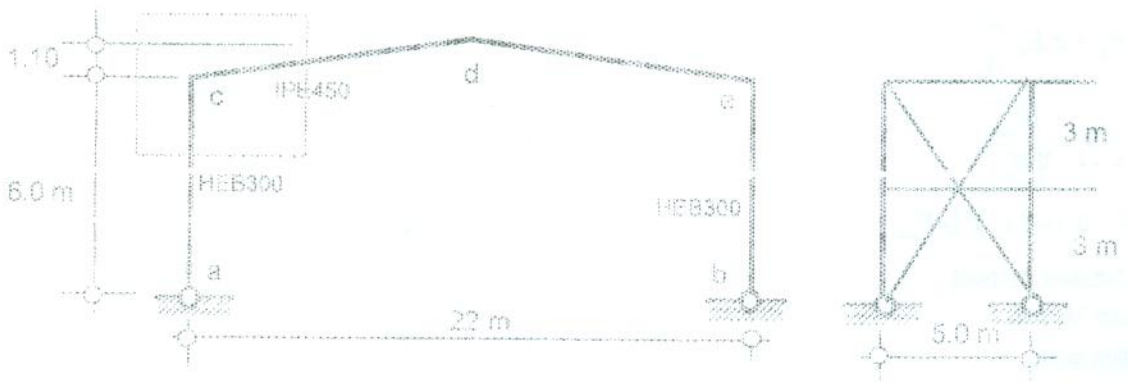
- Use St52 ($F_y = 3.6$ t/cm^2 and $F_u = 5.2$ t/cm^2). **(14 %)**

b. For the typical beam - column connection at (c), it is required to be designed as Category **(C)**. The connection is subjected to : **(36 %)**

$M_u = 22$ t.m.
$P_u = 4.1$ t. (comp.)
$Q_u = V_u = 15.2$ t.

It is required the following:

1- Number of used high strength bolts of type 10.9.
2- Check of weld between the end plate and the rafter of the frame
3- Thickness of end plate connecting the rafter and the frame column.
4- Check of panel-zone web shear (Refer to page 10-7, 10-8 and 10.9) of ECP2008 LRFD, first edition.
5- Do you need additional stiffeners at the corner? (Refer to page 10-10 and 10.11) of ECP2008 LRFD, first edition.
6- Draw the part enclosed by dotted rectangle to scale 1:10.



Question 3: (10 %)

a- Without calculation draw to scale 1:10 different views of the following items:
   i. Typical composite beam.
   ii. Typical composite slab.
   iii. Types of composite columns.

b- Fig. (3) shows a composite column of the type concrete-encased I-section. The maximum normal ultimate load is 210 ton. The used reinforcement is 8 bars of 16 mm diameter. The yield and ultimate stresses of the steel profile and reinforcement are 3.6 t/cm^2 and 5.2 t/cm^2, respectively. The characteristic 28-days cube strength of concrete (f_{cu}) is 0.300 t/cm^2. The effective buckling lengths of the column are ($L_{ex} = L_{ey} = 6.00$ m).

- Check the maximum axial normal force capacity of the column.
- It is also required to find the maximum moment that can be carried by the column using the interaction curve. **(15 %)**

Solution guides:

1- Main column data:
   - Steel section
   - Reinforcement
   - Concrete section

2- Axial Load:
   - Axial column resistance according to the code is given as follows:

$$\phi_c P_n = \phi_c A_s F_{cr}$$

$$F_{ym} = F_{ys} + c_1 F_{yr} \frac{A_r}{A_s} + c_2 F_{cu} \frac{A_c}{A_s}$$

$$E_m = E_s + c_3 E_c \frac{A_c}{A_s}$$

$$\lambda_m = \frac{L_b}{\pi \times r_m} \sqrt{\frac{F_{ym}}{E_m}}$$

$$F_{cr} = \left[1 - 0.384(\lambda_m)^2\right] \times F_{ym}$$

3- Plastic bending moment:
   - Consider $M_n = M_p$

4- Interaction curve:

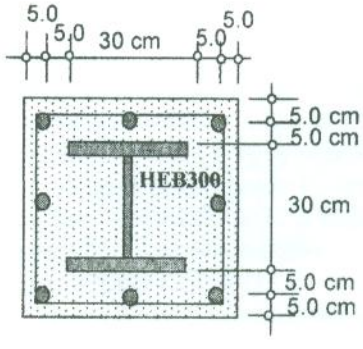
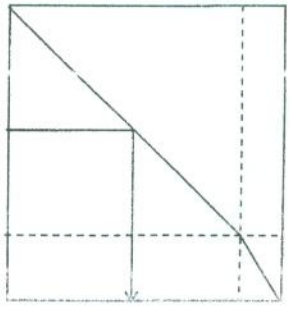


Fig. (3)



"Good luck and may God help you"

Dept.: Structural Engrg.	**Faculty:** Engineering	University : Tanta
Time allowed: 3 hr. **Date:** June 2011	**Course:** Design of steel structures (b)	Course code: CS 326

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 1:

It is desired to design car-shed units beside the main entrance of the Faculty of Engineering-Tanta University. Each unit should cover an area of 12 x 12 m^2. The suggested statical system is shown in Fig. (1). The spacing between the main systems is **4.0 m**.

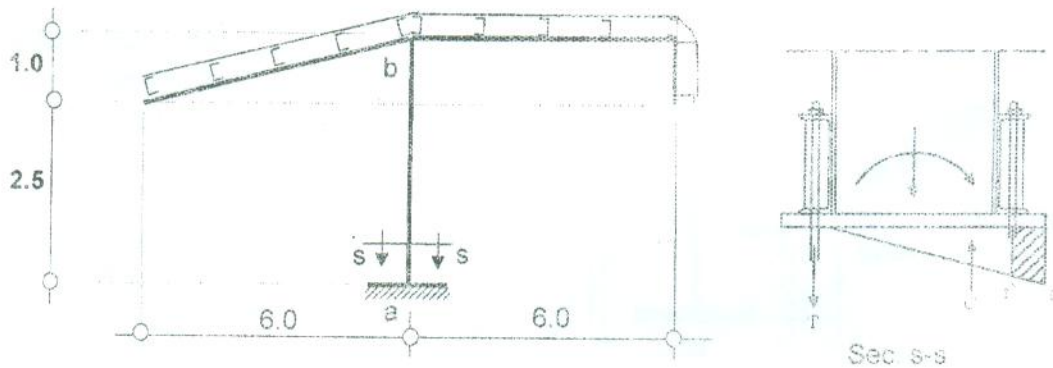


Fig. (1) Statical system of an intermediate frame

The weight of the cover is assumed to be ≈ 10 kg/m^2. Live load intensity is 60 kg/m^2 and wind load are to be taken according to Egyptian Code

For an intermediate main system, it is required the following:

a- Draw to scale 1:100 plan, elevation and side view showing the bracing system. (15 %)

b- Calculate the applied loads assuming one meter between each two purlins. (5 %)

c- Tabulate the **factored** design **normal force, shearing force** and **bending moment** for the critical sections at a and b (case of loading is necessary). (10 %)

d- Design the fixed base at (a) assuming a suitable column dimensions (20 %)

e- Estimate the buckling length of the column. (02 %)

Tanta University

Department: Structural Engineering
Total Marks: ٣٥ Marks

Faculty of Engineering

Course Title: Technical Reports Date: Jun. 2011 (Second term)	Course Code: CS32 H7 Allowed time: 2 hrs	Year: 3rd No. of Pages: (1)

المادة : تقارير فنية **الزمن : ساعتان** **الفرقة : ٣ انشاءات(لائحة قديمة)**

أجب عن الاسئلة الاتية :

١- أذكر المراحل والدراسات التى يمر بها تنفيذ أحد المشروعات الهندسية.

٢- وضح بايجاز الخطوات الرئيسية لاعداد التقرير الفنى لاحد المنشآت الخرسانية.

٣- تعد التقارير الفنية لاختبارات مواد البناء والخرسانة من أهم وسائل ضبط وتأكيد الجودة .
(أ) وضح بعض النماذج المختلفة للتقارير الفنية لتحديد صلاحية الاسمنت ، ركام الخرسانة ، حديد التسليح ،تعيين مقاومة الضغط للخرسانة
(ب) عند اجراء اختبار الضغط على ثلاث مكعبات للخرسانة (١٥*١٥*١٥ سم) تاريخ الصب ٢٠١١/٥/١ وتاريخ الاختبار ٢٠١١/٥/٢٩ كان متوسط حمل الكسر ٥٠ طن ومتوسط وزن المكعب ٩ كجم، وضح فى تقرير فنى نتيجة الاختبار بحساب كل من :
(العمر، الكثافة ، مقاومة الضغط للخرسانة) .

٤- ماهى الشروط الواجب توافرها فى المهندس المكلف باعداد وكتابة التقرير الفنى ؟

٥- أذكر مع التوضيح بالرسم أمثلة مختلفة لبعض أنواع الشروخ التى قد تحدث فى الحوائط الطوب و بلاطات الاسقف والكمرات الخرسانية المسلحة.

Course Examination Committee:

Assoc. Prof. Al-Saeed Maaty & Assis. Prof. Mariam Ghazy