Tanta University

Department: Structural Engineering
Total Marks: 70 Marks

Faculty of Engineering

Course Title: Structure Analysis (3)	Course Code: CS3201	Year: Third Year (هندسة إنشائية - لائحة قديمة)
Date: June, 2010 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following questions… assume any missing data…)

Q1) Problem (1) 13 Marks:

Using the moment distribution method, draw the **B.M.D.** for the given frame of variable I shown in Fig. (1).

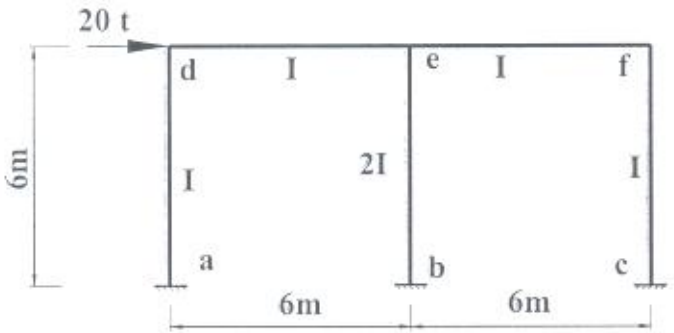


Fig. 1

Q2) - Problem (2) 10 Marks

For the given beam shown in Fig. (2) construct the influence lines for the reactions Y_a, M_a and Y_b.

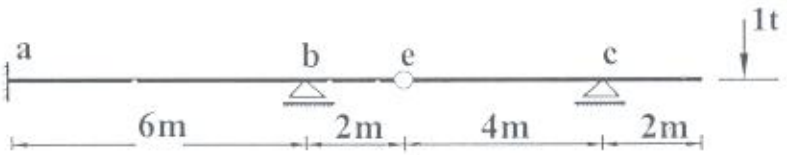


Fig. 2

3- Problem (3) 15 Marks:

For the given frame shown in Fig. (3), construct the influence lines for the reactions at **a** and **b**. Also construct the influence lines of the straining actions (**N, Q and M**) at sections **s-s** and **m-m**.

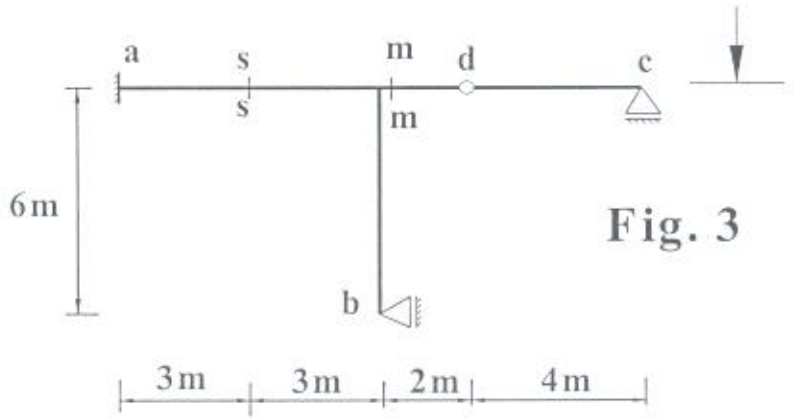


Fig. 3

4- Problem (4) 12 Marks:

a-Find the plastic modulus and plastic moment of the section shown in Fig. (4-a), if the yield stress is 2.5 t/cm^2.

b- For the given continuous beam (abcd) as shown in Fig. (4-b), each span has different section and thus plastic moment. Determine the collapse load W_c. Which is the critical span?

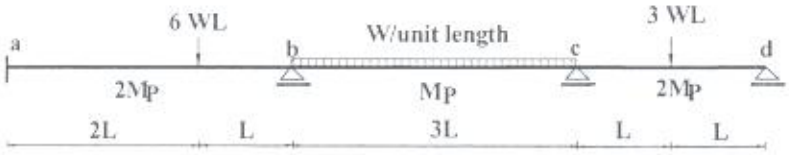


Fig. (4-b)

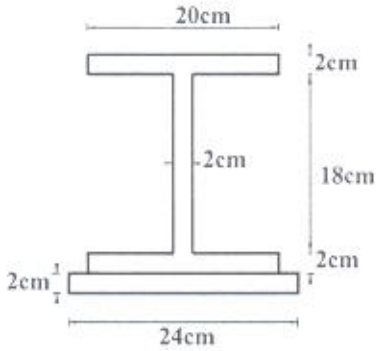


Fig.(4-a)

5- Problem (5) 10 Marks:

Determine the load factor against collapse for the given portal frame shown in Fig. (5), if the plastic moment is constant for the beam and columns and equal to 60 t.m

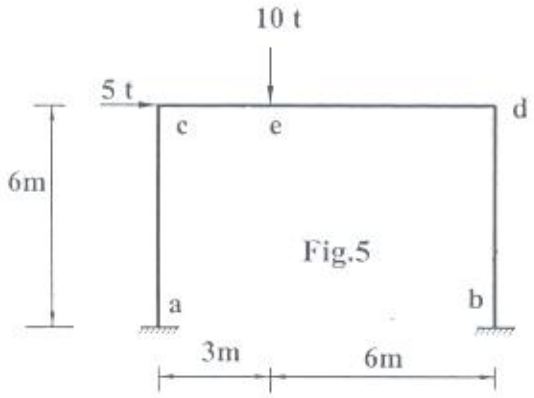


Fig.5

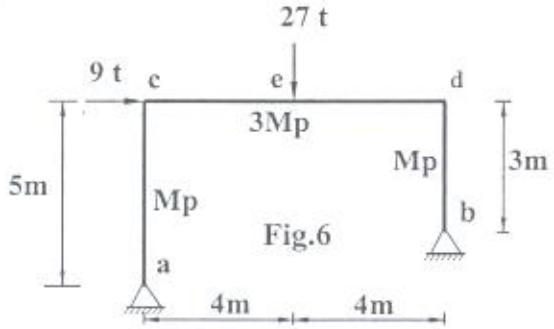


Fig.6

6- Problem (6) 12 Marks:

The two-hinged frame shown in Fig. (6) carries vertical and horizontal loads. If the plastic moment Mp= 30 t.m, determine:

(a) The critical collapse mechanism.

(b) The load factor against collapse.

(c) The B.M.D at collapse.

With the best wishes

Course Examination Committee

Prof. Dr. Mohamed A. Kasem Prof. Dr. Saher El-Khoraby Dr. Tarek Mohamady Khalifa

Course Coordinator: Dr. Tarek Mohamady Khalifa

Dept.: Structural Engrg.	**Faculty:** Engineering	**University** : Tanta
Time allowed: 3 hr. **Date:** June 2010	**Course:** Design of steel structures (b)	**Course code:** CSE3224 : CS3103

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:

(25 %)

Check of bending stress for the given simply supported pate girder with span 20 m of I- cross-section using the following data.

Data.

- M_u = 300 t.m
- L_b = 3.5 m
- Upper flange is 30 x 2.4 cm
- Lower flange is 40 x 3.2 cm
- Web is 115 x 1.2
- Use ST52

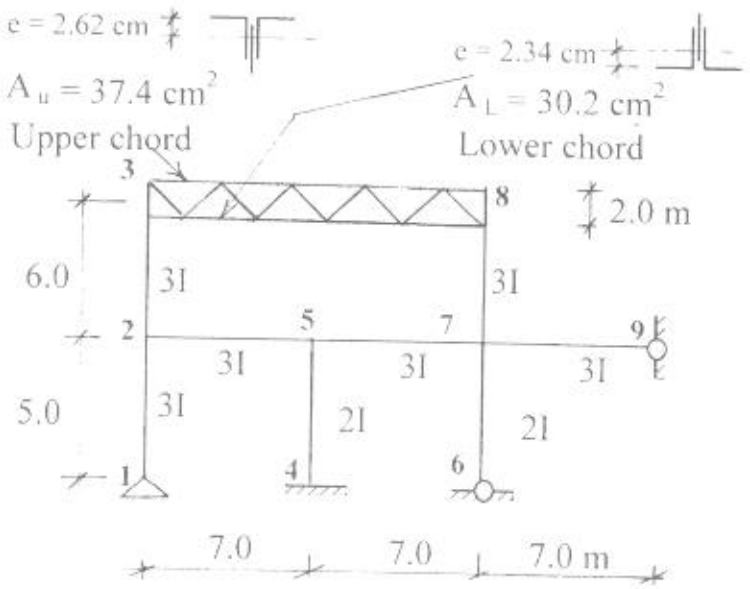
The followings are considered in the solution:

1. **Classification of section**
2. **Plastic N.A and plastic moment**
3. **Elastic properties of the cross-section**
4. **The nominal flexural strength M_n shall depend on the lateral unbraced length of the member (L_b) then Get M_n or M_n'**
5. **Compare M_n and M_u**

Question 2:

(12 %)

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



I = 3000 cm ^{4}

Fig. (2)

Question 3: **(20 %)**

The connection shown below is subjected to ultimate bending moment of 20 t.m and ultimate shearing force of 8 t. Assume that the top flange connection resists (**only**) the tension force due to moment and the web connection resists (**only**) the shearing force. Determine **the number of M22 bolts** (N1 and N2) of high-strength friction type (category C according to ECP205) 10.9. Also, estimate **the thickness of the top cover plate**.

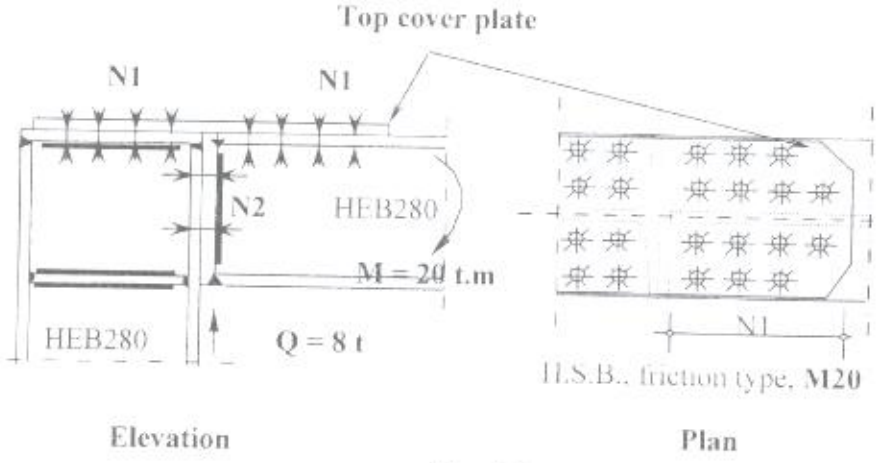


Fig. (3)

Question 4:

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 ultimate load of **40 t**., in addition to an eccentric ultimate load of **10 t**, as shown. The column may be assumed of constant inertia. **(25 %)**

4.b. Design the fixed base (a) and draw to scale 1:10 elevation, plan and side view to show the detail of the base; Fig. (4). **(26 %)**

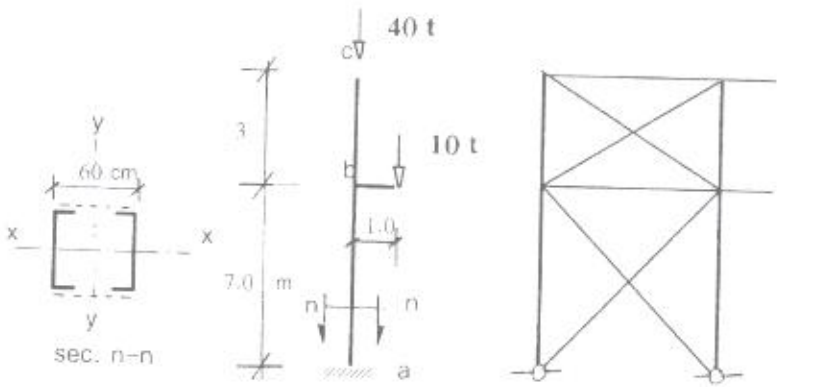


Fig. (4)

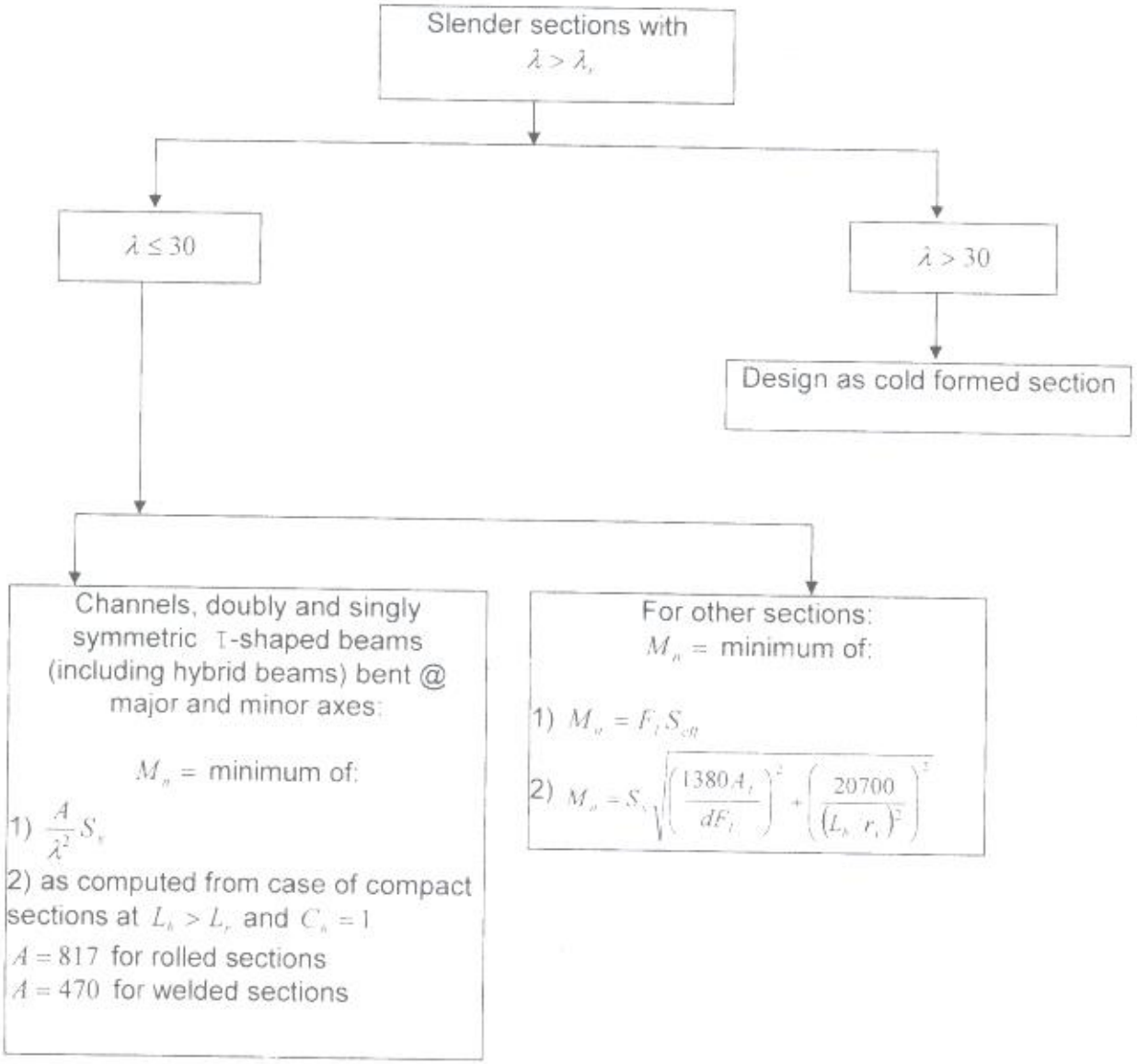
Question 5:

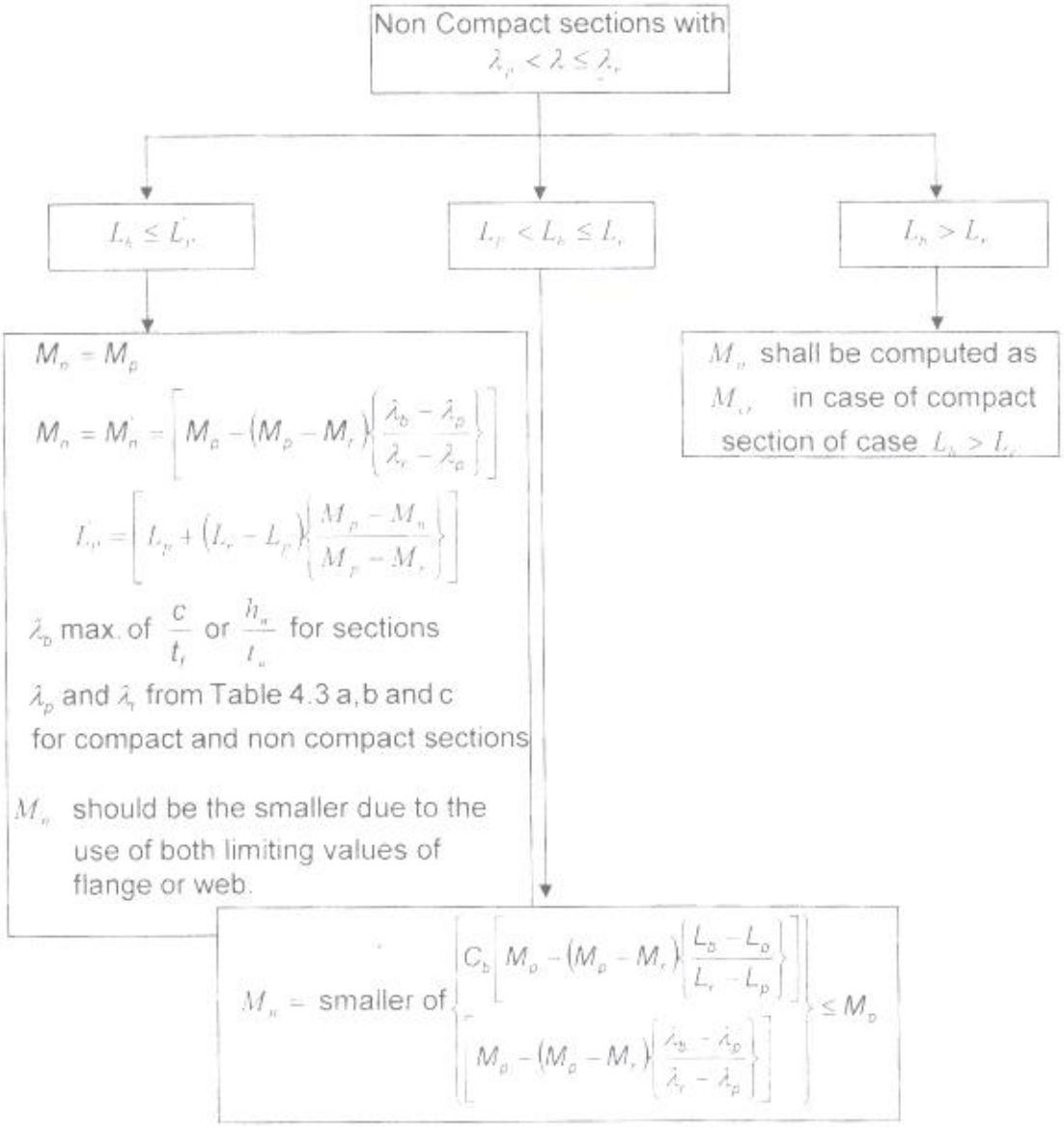
(10 %)

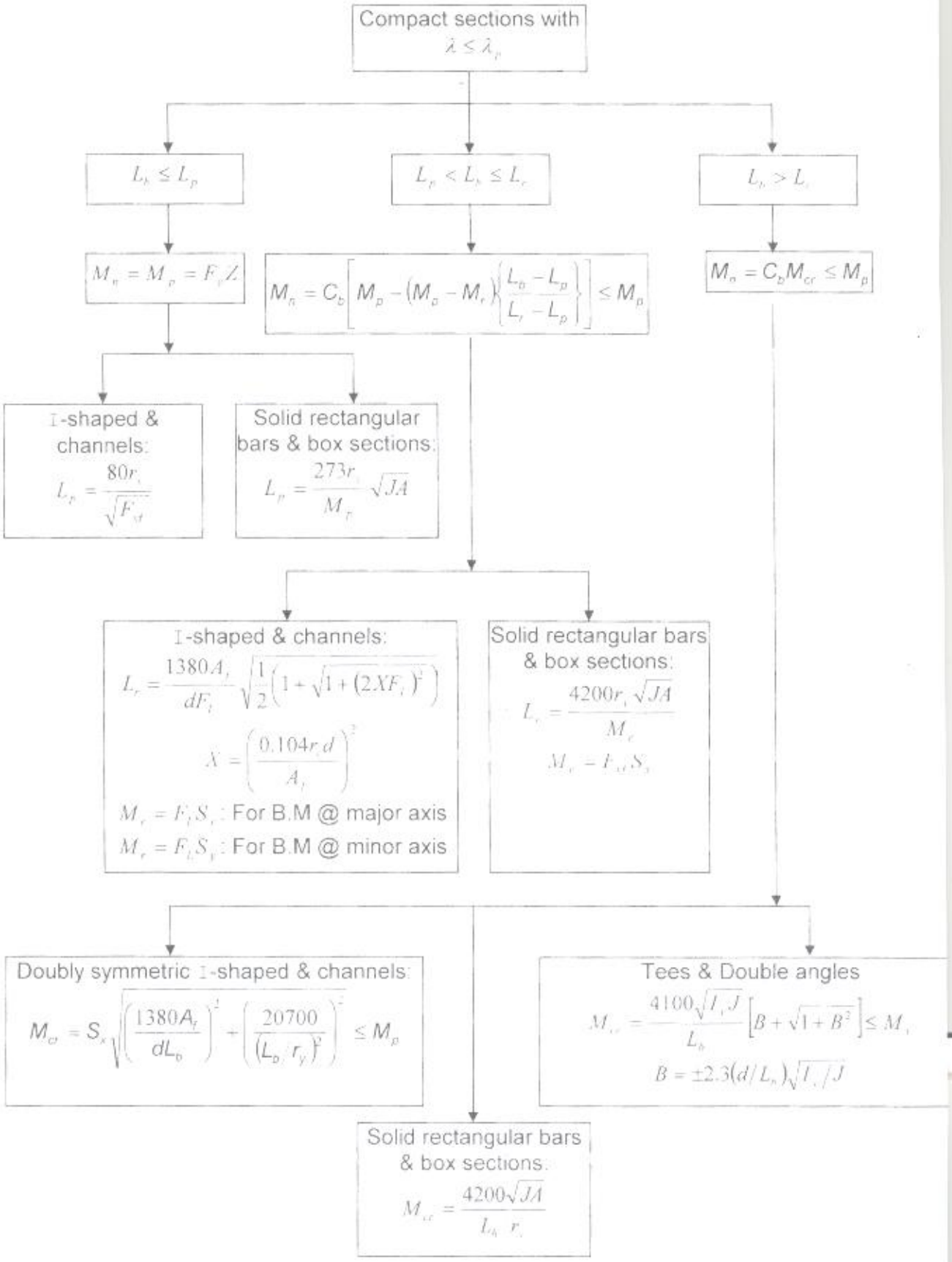
a. Explain briefly with net sketches the following:

i. Types of composite columns.
ii. Types of shear connectors.
iii. Types of shear connection between the steel beam and the concrete slab.
iv. Types of the cross-sections of crane track girder.

Best wishes
Prof. Dr. Mohamed A. Dabaon
and the Exam. Committee


Slender sections with
$\lambda > \lambda_r$
$\lambda \le 30$
$\lambda > 30$
Design as cold formed section
Channels, doubly and singly symmetric I-shaped beams (including hybrid beams) bent @ major and minor axes:
M_n = minimum of:
1) $\frac{A}{\lambda^2} S_x$
2) as computed from case of compact sections at $L_b > L_r$ and $C_b = 1$
$A = 817$ for rolled sections
$A = 470$ for welded sections
For other sections:
M_n = minimum of:
1) $M_n = F_y S_{eff}$
2) $M_n = S_{xc} \sqrt{\left(\frac{1380 A_f}{d F_y}\right)^2 + \left(\frac{20700}{(L_b / r_T)^2}\right)^2}$


Non Compact sections with $\lambda_p < \lambda \le \lambda_r$
$L_b \le L_p$
$L_p < L_b \le L_r$
$L_b > L_r$
$M_n = M_p$
$M_n = M_n = \left[M_p - (M_p - M_r)\left\{ \frac{\lambda_b - \lambda_p}{\lambda_r - \lambda_p} \right\} \right]$
$L_p = \left[L_p + (L_r - L_p)\left\{ \frac{M_p - M_n}{M_p - M_r} \right\} \right]$
λ_b max. of $\frac{c}{t_f}$ or $\frac{h_w}{t_w}$ for sections
λ_p and λ_r from Table 4.3 a, b and c for compact and non compact sections
M_n should be the smaller due to the use of both limiting values of flange or web.
M_n shall be computed as M_n in case of compact section of case $L_b > L_r$
M_n = smaller of $\left\{ \begin{matrix} C_b\left[M_p - (M_p - M_r)\left\{ \frac{L_b - L_p}{L_r - L_p} \right\} \right] \\ \left[M_p - (M_p - M_r)\left\{ \frac{\lambda_b - \lambda_p}{\lambda_r - \lambda_p} \right\} \right] \end{matrix} \right\} \le M_p$


Compact sections with $\lambda \le \lambda_p$
$L_b \le L_p$
$L_p < L_b \le L_r$
$L_b > L_r$
$M_n = M_p = F_y Z$
$M_n = C_b \left[M_p - (M_p - M_r) \left\{ \frac{L_b - L_p}{L_r - L_p} \right\} \right] \le M_p$
$M_n = C_b M_{cr} \le M_p$
I-shaped & channels:
$L_p = \frac{80 r_y}{\sqrt{F_y}}$
Solid rectangular bars & box sections:
$L_p = \frac{273 r_y}{M_p} \sqrt{JA}$
I-shaped & channels:
$L_r = \frac{1380 A_f}{d F_L} \sqrt{\frac{1}{2}\left(1 + \sqrt{1 + (2XF_L)^2}\right)}$
$X = \left(\frac{0.104 r_y d}{A_f} \right)^2$
$M_r = F_L S_x$: For B.M @ major axis
$M_r = F_L S_y$: For B.M @ minor axis
Solid rectangular bars & box sections:
$L_r = \frac{4200 r_y \sqrt{JA}}{M_r}$
$M_r = F_{cr} S_x$
Doubly symmetric I-shaped & channels:
$M_{cr} = S_x \sqrt{\left(\frac{1380 A_f}{d L_b} \right)^2 + \left(\frac{20700}{(L_b / r_y)^2} \right)^2} \le M_p$
Tees & Double angles
$M_{cr} = \frac{4100 \sqrt{I_y J}}{L_b} \left[B + \sqrt{1 + B^2} \right] \le M_y$
$B = \pm 2.3 (d / L_b) \sqrt{I_y / J}$
Solid rectangular bars & box sections:
$M_{cr} = \frac{4200 \sqrt{JA}}{L_b / r_y}$

Tanta University | Department: Structural Engineering | Faculty of Engineering

Total Marks: 35 Marks

Course Title: Technical Reports	Course Code: CS32 H7	Year: 3rd
Date: Jun. 2010 (Second term)	Allowed time: 2 hrs	No. of Pages: (1)

المادة : تقارير فنية الزمن :ساعتان الفرقة : 3 انشاءات(لائحة قديمة)

أجب عن الاسئلة الاتية :

1- متى يلجأ المهندس لاعداد وكتابة التقرير الفنى ؟
ولما يعد التقرير الفنى أعم وأشمل من التقرير الهندسى ؟

2- أذكر مع التوضيح برسم كروكى العناصر الاساسية لخطوات ومراحل اعداد التقرير الفنى لاحد المنشآت .

3- تعد التقارير الفنية لاختبارات مواد البناء والخرسانة من أهم وسائل ضبط وتأكيد الجودة .
وضح بعض النماذج المختلفة للتقارير الفنية لتحديد صلاحية الاسمنت , ركام الخرسانة , حديد التسليح.

4- أذكر أهم الاسباب التى يمكن أن تؤدى الى حدوث العيوب بالمنشآت الخرسانية المسلحة موضحا بعض أشكال هذه العيوب .

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

With the best wishes

Course Examination Committee:

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

Tanta University
Faculty of Engineering
Structural Engineering Department
3rd year Structural Engineering

Foundations Engineering (1), CS3205
Term Exam, June. 2010
Sunday; 20 / 6 / 2010
Allowable time: 3 hours

(هندسة إنشائية – لائحة قديمة)

Answer all the following questions. (Exam mark =70)

Question No. (1) (12 point)

(a) Differentiate between driven and bored piles. **(2 point)**

(b) Show using clear sketches how to use field tests to estimate the safe pile load. **(2 point)**

(c) A group of 4-driven piles 21.0 m long and 40 cm in diameter was driven in clay layer at spacing 1.20 m. The profile consists of a thick layer of medium clay with the following properties: the water table is located at the ground level, the clay extend to 40 m, $C = 30\ kN/m^2$, $m_{vc} = 0.00025\ m^2/kN$ and $\gamma = 18\ kN/m^3$.

Estimate the maximum column load and the expected settlement of the group. **(8 point)**

Question No. (2) (12 point)

(a) What is the meaning of negative skin friction; state its effect on the pile resistance. **(3 point)**

(b) For the shown plan of the four pile cap in figure 1, if the thickness of the cap is 0.90 m and the bottom reinforcement in both directions is 7 φ 22 /m (high tensile steel), you are required to:

Find out the safe column load can be supported by this cap. **(9 point)**

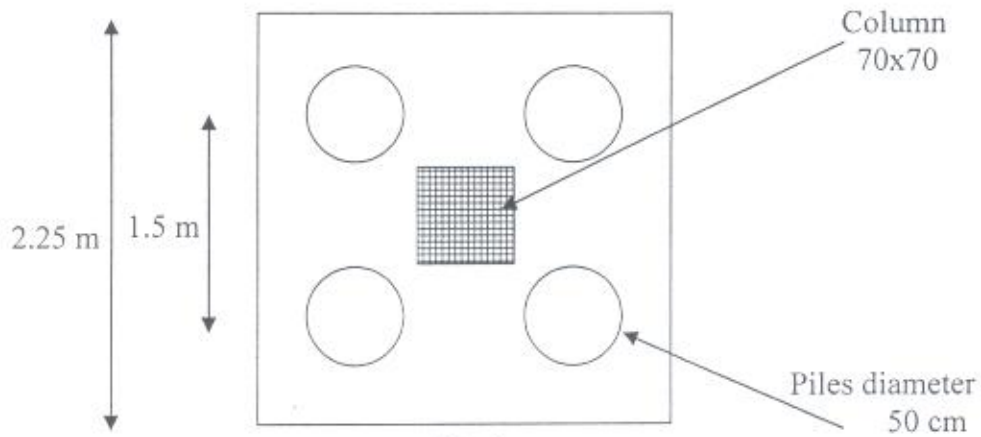


Fig. 1

Question No. (3) (11 point)

(a) Using suitable scale, draw clear sketches for three piles cap and strap beam reinforcement. **(3 point)**

(b) Classify pile according to its material and mode of load transfer **(2 point)**

(c) Fig. 2 shows the results of pile load test performed in single pile with the following properties; pile length = 19.0 m, pile diameter = 0.50 m; working pile load = 50 tons

Find out the safe pile load, and check the settlement **(6 point)**

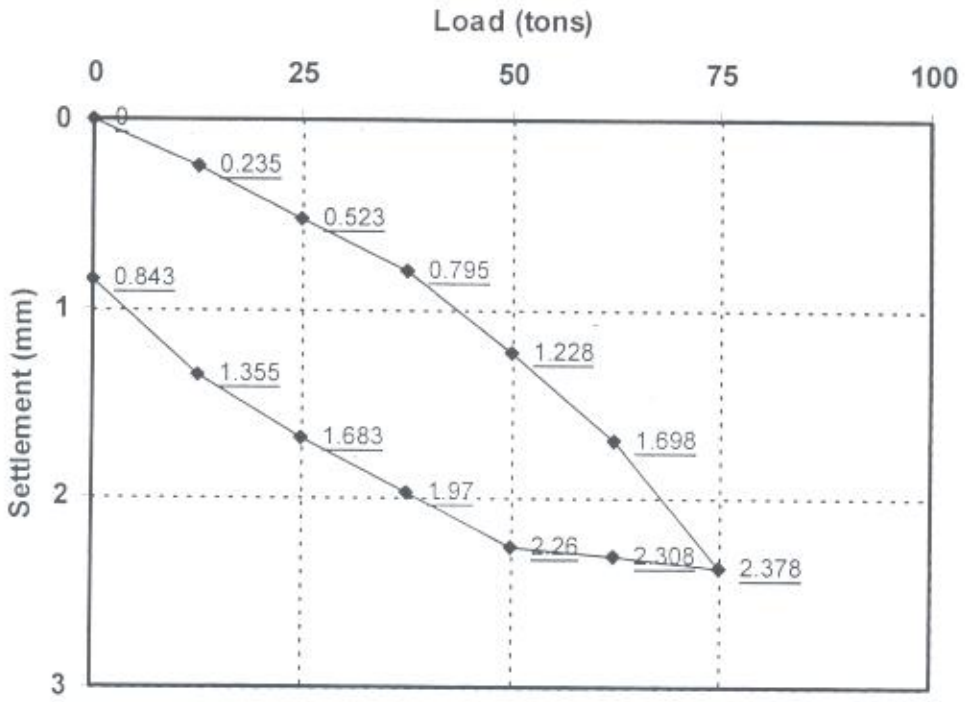


Fig. 2 pile load test results

Question No. (4) (12 point)

(a) Discuss the advantiguies of using plain concrete footings under:

(i) isolated reinforced concrete footing. (ii) raft footing **(3 point)**

(b) Fig. 3 shows the plan of two adjacent columns. The left column is (40 x 40) cm and carries 80 t and the right column is (40 x 60) cm and carries 100 ton. The distance center to center of columns is 3.60 m and the net allowable soil pressure is 1.00 kg/cm^2. The distance between the outer column and the property line is 0.50 m as shown in the figure. If the thickness of plain concrete layer = 20 cm, you are required to:

(i) Give the dimensions of the outer and inner footings and the strap beam. **(3 point)**

(ii) Design only the strap beam. **(3 point)**

(ii) Give detailed drawing of the beam reinforcement **(3 point)**

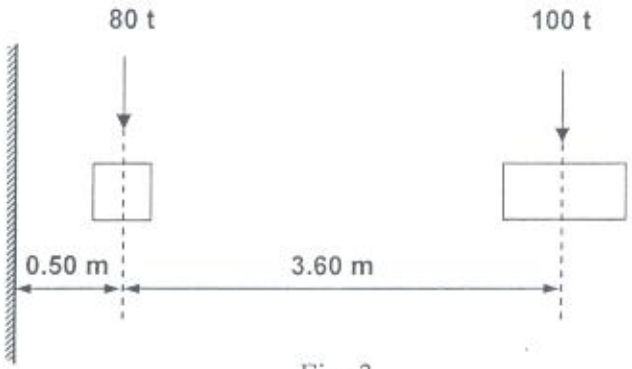


Fig. 3

FACULTY OF ENGINEERING - TANTA UNIVERSITY
DEPARTMENT OF STRUCTURAL ENGINEERING
EXAMINATION (THIRD YEAR) STUDENTS OF STRUCTURAL ENGINEERING لائحة قديمة

COURSE TITLE: DESIGN OF REINFORCED CONCRETE STRUCTURES (2)			COURSE CODE: CS 3202
DATE: JUNE - 2010	TERM: SECOND	TOTAL ASSESSMENT MARKS: 70	TIME ALLOWED: 3 HOURS
For all problems consider that: f_{cu}=35MPa, St.400/600	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 (25 marks)

Fig. 1 shows a sectional elevation and the statical system of an intermediate frame ABCDEFGHIJ of series of a frames spaced 5m. The frame is considered to be braced in the two directions in-and-out of plane of the frame. The frame is hinged at B and link member AC. The frame breadth is **500mm** and the slab thickness is **120mm**. The concrete dimensions of the frame are given on the sectional elevation. For the sake of simplicity the concentrated loads are considered as a uniform loads. The **reactions are given** on the figure and the force of the **tie is 244.96kN**. The B.M.D, S.F.D and N.F.D of the upper part of the frame EFG are given. For the given factorized (ultimate loads), it is required to carry out the following:

i- Complete drawing the B.M.D, S.F.D and N.F.D of the frame. **(8 marks)**
ii- Design the critical sections and check shear stresses of the frame. **(9 marks)**
iii- Draw to a convenient scale the intermediate frame in elevation and in cross sections showing reinforcement details and its arrangement. **(8 marks)**

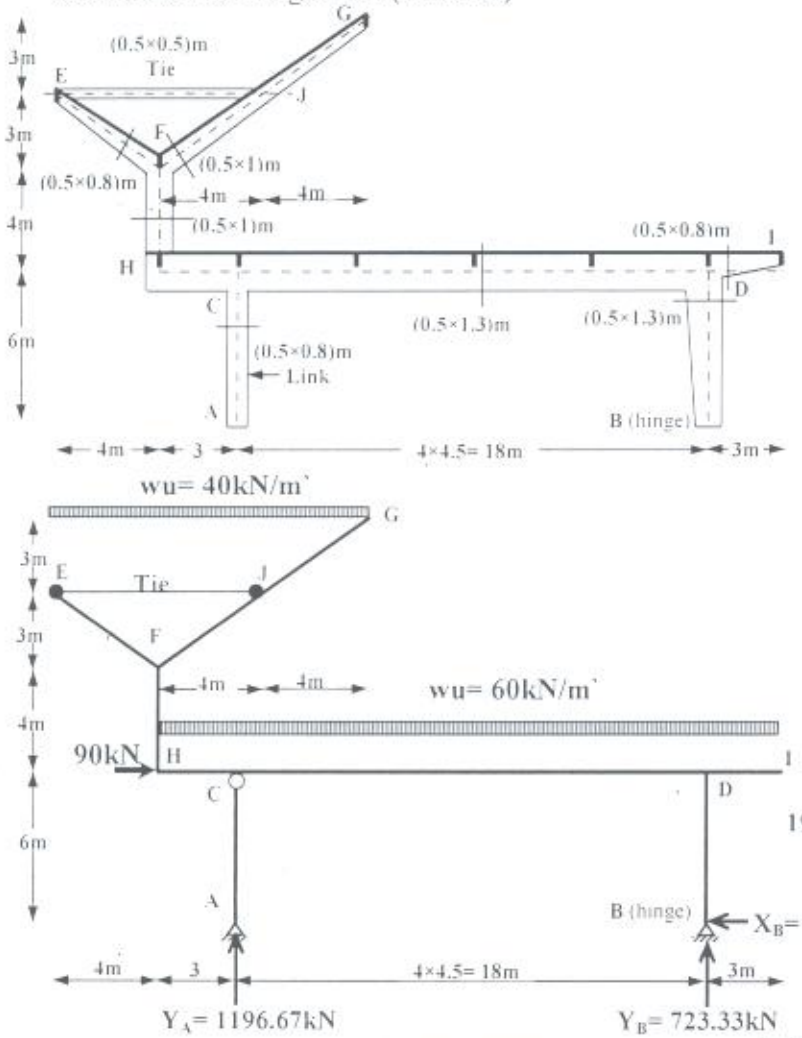
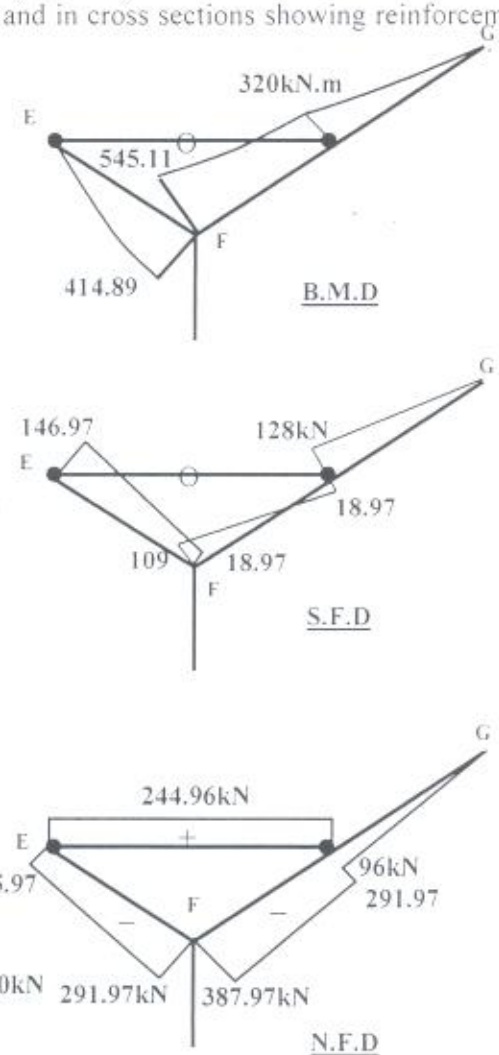


Fig. 1 Statical system



B.M.D, S.F.D and N.F.D for upper part EFG

PROBLEM # TWO (20 marks)

I- What are the advantages of choosing axes of MSE coincide on line of pressure. **(1 mark)**
II- Explain the effect of tie, hangers and stiffener on analysis of arched slab. **(2 mark)**
III- State the effect of tie elongation and elastic deformation in analysis of arch girder? **(1 mark)**
IV- Fig. 2 shows a structural plan of stair case of a residential building. It is required to sketch **(without any calculations)** the B.M and the reinforcement details of the stair slabs and its supports. **(8 marks)**

Please Turn Over →

V- Fig. 3 shows a Vierendeel girder of span 20m. It is required to carry out the following: What are the assumptions to be solving the Vierendeel using the empirical method. 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). **(8 marks)**

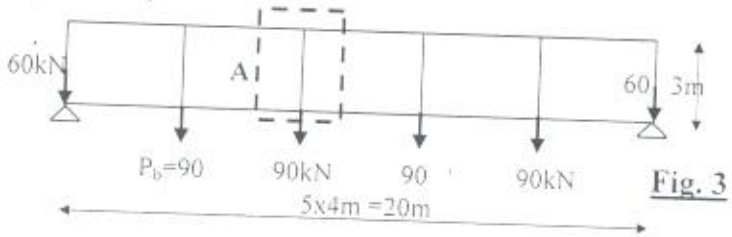


Fig. 3

PROBLEM # THREE (35 marks)

A- Fig. 4 shows a plan and sectional elevation I-I of an industrial hall of area 13×20m. A north light roof system is required. The supported columns are allowed only at axes AB and EF. The left side parking CD is required. It is required to carry out the following:

i. Suggest the main supporting elements needed to carry the roofs. **(3marks)**

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

iii. Illustrate using sketches **(Without any calculations)** the load transfer from the roofs to a foundations. **(5 marks)**

iv. Illustrate using sketches the effect of increasing post inclination, θ, to 50.2° on the footings A and E. What is your opinion of using tie in this case? State the significance of angle α. **(5 marks)**

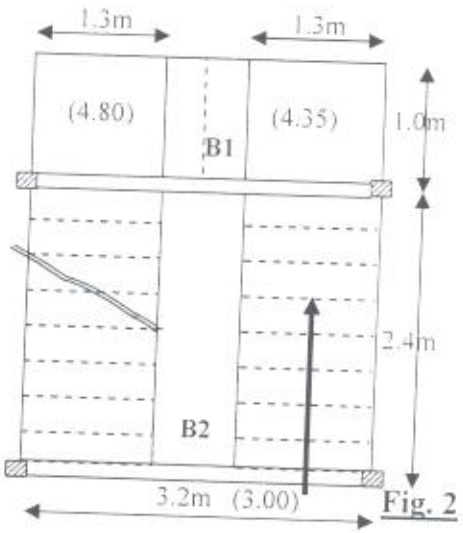
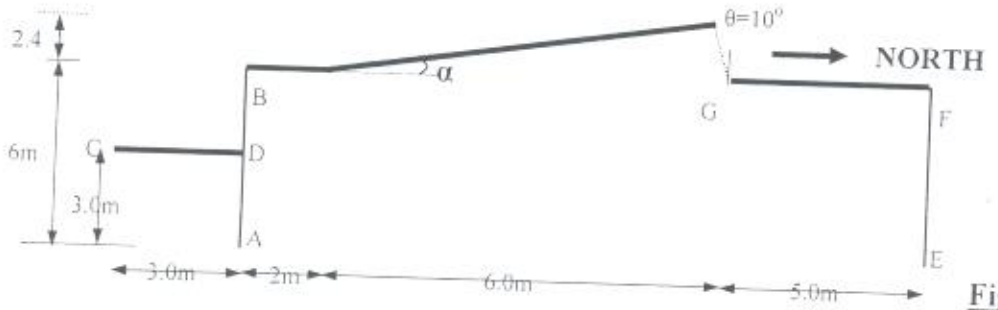


Fig. 2



Sectional elevation I-I

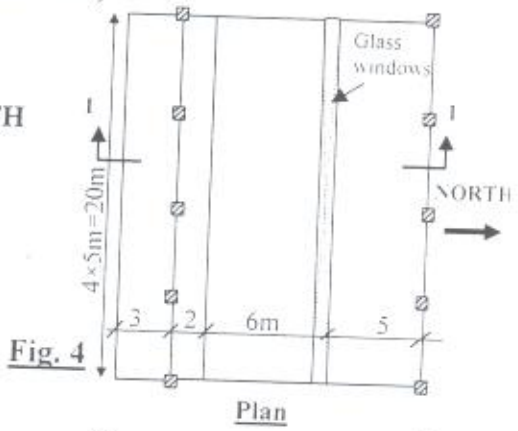


Fig. 4

Plan

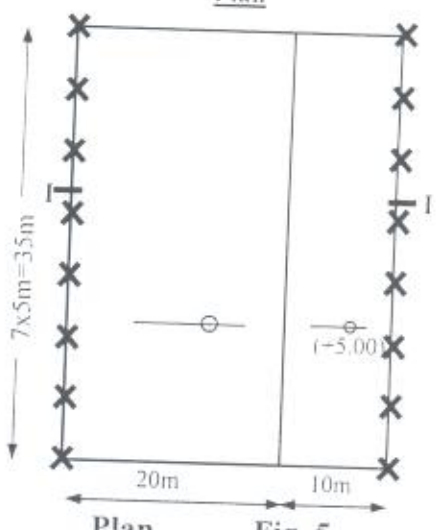
B. Fig. 5 shows plan and sectional elevations I-I of an industrial hall of area 30×35m. The columns where marked X are allowed only at the outer perimeter of the hall. Levels of the covering roofs are shown on plan and in cross-section I-I. It is required to carry out the following:

i. Suggest the systems of more economical Main Supporting Elements (MSE) and the roof slabs. Draw to reasonable scale the sectional elevation I-I and part plan showing the concrete dimensions of all structural elements. **(5 marks)**

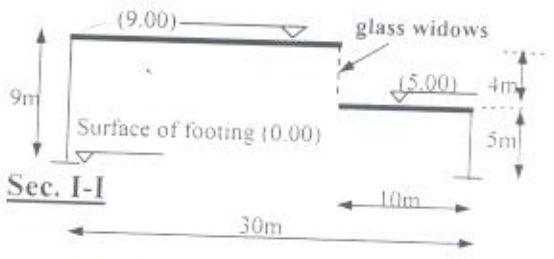
ii. Calculate the applied loads on the suggested MSE if the average ultimate dead and live loads, (g_u and p_u) of the roof slab not included weight of MSE are **10kN/m²** and **3kN/m²**, respectively. The own weight of MSE may be estimated. **(3 marks)**

iii. Design the MSE of the hall and its components. **(5 marks)**

iv. Draw to reasonable scale the sectional elevation I-I of MSE and its components showing the reinforcement details. **(4 marks)**



Plan Fig. 5



Sec. I-I

أطيب الأمنيات بالتوفيق

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